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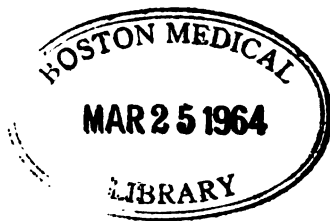
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James Pherson

A TREATISE ON

Urological and Venereal Diseases.

BY

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PREFACE.

Within the last few years the field of Urology, with the pathology and the treatment of the diseases allotted by general consent to it, has materially broadened and developed. In this volume the advance is further emphasized by the special attention given to the hygiene of the urogenital tract, surgical technique and post-operative treatment.

In the preparation of this book the author, to make it of practical advantage to the general physician, has endeavored to give a clear and thorough presentation of the approved essentials and principles involved in the pathology, clinical history, diagnosis, prognosis and treatment of the urological and venereal diseases. Particularly has he set forth his personal experiences and conclusions, derived from his private work and clinical service at the Metropolitan, Hahnemann and Flower Hospitals, together with the advanced opinions of the leading urologicians and specialists in venereal disorders. Further, he has attempted to make this volume distinctive by the space devoted to the application of homœopathic principles for the cure of disease.

The author desires to acknowledge his indebtedness to the standard works on this subject, both American and Foreign, to the periodical literature of recent years, and particularly to Boericke & Runyon, the publishers of his previous works—*Disorders of the Sexual Organs of Men*, *Uro-poietic Diseases*, and *Genito-Urinary and Venereal Diseases*—from which, in some few subjects, he has taken freely; to thank Dr. Horace Packard, of Boston, for illustrations, which appeared in the *New England Medical Gazette*; Dr. Bransford

Lewis for permission to reproduce his illustrations of lesions of the prostate, which appeared in the *Annals of Surgery*; Dr. Carl Beck, for cuts from the *New York Medical Journal*, and Dr. F. Tilden Brown, for private photographs; also, J. B. Lippincott Co., for the loan of cuts from White and Martin's *Genito-Urinary and Venereal Diseases*; Saunders, from the *American Textbook of Genito-Urinary Diseases and Dermatology*, and from Hyde & Montgomery's *Venereal Diseases*; Morris, *Genito-Urinary Surgery*. He wishes also to take this opportunity to convey his appreciation to Mr. Chas. Brush and Mr. H. C. Lehmann for their valued assistance in the preparation of the new illustrations; to Dr. John E. Wilson for the articles contributed on Syphilis of the Brain and Nervous System, and to Dr. Howard L. Coles and Dr. R. du Jardin for their assistance in the preparation of the manuscript for press.

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Urological and Venereal Diseases.

SECTION I.

INTRODUCTION.

Strict adherence to scientific cleanliness is equal in its import to an intimate knowledge of the minute and gross anatomy of the urogenital tract, its abnormalities and pathological possibilities. In the light of modern bacteriological research, urological instrumentation without proper regard to asepsis and antisepsis is nothing short of criminal. There are too many sources of unavoidable infection in the special technique of genito-urinary surgery to allow of the least latitude in the use of the known precautions.

In the general preparation, the field of operation, the hands of the surgeon and the instruments to be used should be subjected to as severe antiseptic treatment as their substances will allow, and, previous to urethral or vesical instrumentation, it is advisable to administer for a few days drugs which when eliminated by the kidneys have an antiseptic action upon the urinary tract.

Previous to a urological examination, the surgeon should wash his hands with soap and hot water, then immerse them either in a 10 per cent. solution of Borolyptol, or a 1-2000 solution of Bichloride of mercury, and in surgical operations of even a minor character he should employ proper methods of asepsis and wear rubber gloves.

Before urethral instrumentation the patient should, after re-

leasing his suspenders and loosening his trousers, evacuate his bladder and assume the dorsal position upon the table or chair. A folded sterile towel should be placed between the penis and the scrotum, and another above the penis to cover the mons veneris, thus leaving only the penis exposed. When manipulating the penis, it is advisable for the surgeon to use rectangular, sterile, gauze sheets, about four by six inches in size and of at least three thicknesses, not only for aseptic purposes, but to protect himself against possible infection. Where there is a foreskin, it should be retracted and it and the glans penis wiped with small pledgets of absorbent cotton wet with a 10 per cent. solution of Borolyptol, a 4 per cent. Boric acid or a 1-1000 Bichloride of mercury. The last is preferable when specific conditions are present.

Cleansing of the urethra previous to its examination or instrumentation, particularly to remove the legions of pathogenic and non-pathogenic micro-organisms which are present in its first two inches, has been the subject of grave discussion and much difference of opinion. It is claimed by some that even the irrigation of the urethral canal with a mild antiseptic solution destroys some of the delicate epithelial lining, and thus, instead of establishing a defense, removes the barriers that prevent micro-organisms entering the general circulation. When the urethra is free from pathogenic micro-organisms, irrigation preceding instrumentation may be omitted. If pyogenic organisms exist or are suspected, the urethra should be irrigated to prevent the possibility of their being carried into the deeper genitalia. Douching of the urethra for cleansing purposes is best accomplished by repeated distension of the anterior urethra with a 4 per cent. warm aqueous solution of Boric acid, by means of a blunt-nozzled syringe having a capacity of about half an ounce. This solution has mild antiseptic properties, is non-irritating, and when employed in this way floods the anterior

urethra and washes out all loose micro-organisms. When pathogenic organisms are present, irrigation with a warm aqueous solution of Bichloride of mercury, 1-10,000, before and after instrumentation is advisable; its use will generally prevent septic infection and urethral fever. Excessive sensibility of the urethra with a tendency to spasm may be overcome by distending the urethra with two drachms of an aqueous solution of Cocaine, 2 per cent., and Carbolic acid, 1 per cent., for one minute. The retention of this solution for three minutes will produce local anæsthesia sufficient for the performance of a painless meatotomy or internal urethrotomy. The presence of the Carbolic acid gives this solution mild antiseptic properties; the Cocaine is not free from danger as it has sometimes produced pronounced general physiological poisoning and even death.

Steel urethral instruments must be smooth, free from blemish and highly polished. Before using, they should be sterilized by steam or by boiling for five minutes in a solution of Bicarbonate of soda, one drachm to the quart of water, the Soda preventing rusting. A fish kettle will answer as a sterilizer, but it is advisable to use one of modern pattern. Cleansing of steel cutting instruments by boiling destroys their edges and necessitates frequent sharpening; they may be sterilized by immersion for a prolonged period in a solution of Lysol, 1-1000, after being washed thoroughly with soap and hot water. Catheters, bougies and other elastic instruments are best cleansed by steam, though, unless they are made entirely of rubber, they will, in a short time, lose their polish and become fissured and useless. When steam sterilization is impossible, or it is desirable to prolong the life of the instrument, it should be washed with soap and hot water, immersed for ten minutes in a 10 per cent. aqueous solution of Carbolic acid, or 1-1000 of Bichloride of mercury, flushed a number of times with the antiseptic

solution, rinsed in sterile water, wiped with sterile gauze, lubricated with either Glycerine or Boroglyceride and wrapped in a sterile towel. Before using the catheter the lubricant should be removed by dipping it in hot water.

Silk, woven and gum-elastic catheters are best sterilized by immersion for five minutes in a 2 per cent. solution of Formaline, followed by rinsing in sterile water. Boiling, steaming, immersion in Alcohol, etc., quickly destroys their texture. Formaline vapor will sterilize elastic and metal instruments, but it is objectionable, as it soon renders the former soft and sticky and corrodes the latter. If the Formaline, which is always deposited upon the instrument, is not entirely removed by immersion in sterile water, it will cause, by its presence, irritation of the urethra and other complications. An instrument, before it is introduced into the urethra, should be warmed and thoroughly lubricated with Lubri-chrondin or Lubraseptic, or traumatism, urethral spasm, etc., may follow.

Soft rubber catheters should be so constructed that the canal terminates in a smooth eye upon the side, with the portion in front of it (the tip) solid, have a smooth unblemished surface, and not show evidence of structural weakness on being twisted.

Irrigating reservoirs should be constructed of glass. They should always be cleansed with boiling water when Permanganate of potash, Boric acid or Saline solutions are to be used, but this is not necessary with those containing Bichloride of mercury or Nitrate of silver, as these in themselves have pronounced germicidal powers. The appropriate glass or hard rubber nozzles must always be properly washed and boiled before being used.

Glass and metal syringes must always be disconnected and rendered aseptic by boiling. The barrels of those composed of glass and rubber or of rubber alone can be sterilized by filling them with a 1-1000 aqueous solution of Bichloride of mercury and allowing it to remain for from fifteen to sixty

minutes, after which they should be thoroughly flushed with sterile water.

The absorbing power of the healthy mucous membrane of the bladder is very slight, and toxic materials may remain in the vesical cavity for a long period without finding entrance into the circulation. The urethral mucous membrane, on the contrary, has great absorbent qualities. When a morbid principle is taken up by the lymphatic radicals of either the bladder or urethra, there results a local or general lymphadenitis, etc.; when taken up by the venous radicals, a rapidly developing septic infection follows. This absorption accounts for the general intoxication which sometimes follows even the use of a 2 per cent. Cocaine solution as a local anæsthetic in the urethra.

Gougan has demonstrated that in the normal urethra, micro-organisms cannot, by their unaided efforts, ascend to the prostatic urethra; that the urine present in the male bladder normally contains no germs; that in the female bladder they are often present owing to the short urethral canal. Germs existing in the bladder may come from three distinct sources, (a) from the urethra, ascending infection, the germs being carried upward by instrumentation, though it may result from a progressive diseased condition; (b) from the kidney, descending infection, as a complication through the kidney of typhoid, diphtheria, septicæmia, and particularly the bacilli coli communi when free evacuation of the bowels is interfered with, and (c) from an outside adjacent focus of infection, the germs passing directly into the bladder through its walls, a condition especially prone to follow suppurative lesions of the deep genitalia.

The bacillus coli communis, sometimes designated as the urobacillus septicus, the bacillus pyogenes, the cocobacillus ureæ pyogenes, the urobacillus non-liquefaciens septicus and the bacterium lactis ærogenes, is the micro-organism most fre-

quently met with in abnormal urine and is the most common cause of urinary infection. Urine containing a pure culture of the bacilli coli communi is acid when voided, the purulent sediment depositing itself as a compact mass at the bottom of the beaker. The urobacillus liquefaciens septicus, occasionally present, is important from its well-known septic properties, having both pyogenic and toxic qualities, and will, when mixed with the urine in the bladder, excite germ proliferation and a true cystitis. The tubercular bacillus produces its own particular lesions. The staphylococcus pyogenes aureus and the streptococcus pyogenes may exist as pure cultures, but they are generally associated with the bacillus coli communis. The gonococcus of Neisser (especially discussed in the chapter on gonorrhœal urethritis) is undoubtedly one of the most important germ factors to be considered in genito-urinary diseases. It, however, rarely exists independently of the common pyogenic micro-organisms, which in large degree account for the gonorrhœal complications in the joints, muscles, serous membranes, etc. As to the origin of the gonococcus, there are many who are of the opinion that it is a transformed urethral diplococcus, derived from the male or female genitalia, which has taken to itself, by means of special evolution, the properties of auto- and hetero-infection.

When the kidneys and bladder are in a healthy condition, all of these micro-organisms may pass through the urinary tract, with the exception of the urobacillus liquefaciens septicus and the gonococcus, without inducing disease. They may even disappear during their transit, infection depending upon traumatism of, or obstructions within, the genito-urinary tract. If the traumatism is slight, and the flow of urine is not impeded, it is of little importance, but long-continued traumatism, such as results from vesical growths or renal calculus, frequently engender germ infection. New growths within the tract also favor infection.

Pyogenic infection may remain indefinitely a local condition. This is proven by the fact that the purulent discharge from a diseased kidney (provided the bladder is healthy and the urethral drainage good) may pass through the bladder for years without infecting it, or a bladder disease may continue for a long period and the kidneys and the urethra remain healthy. But diseased conditions of the urethra, even without over-distension of the bladder, may dam the urine back in the pelvis of the kidney, and induce an ascending infectious disease of that organ.

Antiseptic urethral and vesical douches are usually selected upon personal preference, though the following facts must be considered: That the staphylococcus resists the action of Bichloride of mercury and the bacillus coli communis Nitrate of silver solutions. The streptococcus is readily destroyed by both. Boric acid and Permanganate of potash have little power as true antiseptics. The latter as a urethral douch in a gonorrheal urethritis induces anæmia of the urethral epithelium and by diminishing the supply of nutrition, reduces the vitality of the gonococci; in their enfeebled condition they are then easily washed away. The anterior urethra can be cleansed by prolonged irrigation with sterile water, a saturated solution of Boric acid or a 1-2000 solution of Nitrate of silver, but it is questionable if it can be made perfectly sterile.

Urethral instrumentation of all kinds must be performed with the utmost gentleness, especially when gradual dilatation of the urethra is employed for the cure of a urethral stricture. In this method of treatment the curative effect is not due to the divulsive action of the sound, but to the gentle mechanical stretching of the strictured portion which induces a secondary hyperæmia, with an augmented activity of the veins and lymphatics, the absorbents taking up and conveying to the general circulation the products of retrograde

metamorphosis together with any septic material that may be present. Until the hyperæmia has subsided and absorption is completed (usually five to seven days) further instrumentation is contraindicated. A urethrotomy is usually preferable to gradual dilatation, because irritable, sensitive, contracted stricture tissue is always more easily dealt with by complete division than by forced dilatation, incision being generally followed by relief; dilatation, by inflammation and nervous reaction. Sometimes a distinct and marked urethral fever follows the introduction of a urethral sound when a previous urethrotomy was well borne.

Urinary or urethral fever are the terms applied to the various febrile conditions which may follow instrumentation or operation upon the urethra or the deep urogenital organs. They include phenomena due to nervous reflexes, surgical shock, uræmia and germ infection or toxæmia from the absorption of their products.

Urethral shock sometimes follows the slightest urethral instrumentation, and death has resulted from even the scientific introduction of a urethral sound. If the urethra is irritable and sensitive, urethral instrumentation often excites a varying degree of shock. It is more liable to follow urethral dilatation than a urethrotomy, owing to the fact that the nerve supply of the urethra increases with its depth, being most pronounced in the prostatic region where the cellular tissue is also more abundant. The liability to the development of urinary fever increases with the distance that the injury or seat of operation is from the meatus.

Harrison uses the term "urine fever," and attributes all phenomena attendant upon the absorption into the general circulation of toxic materials at the seat of injury, due to morbid changes in the urine. He says these toxic materials are always injurious, and their absorption is often followed by fatal results. Decomposed urine is very destructive to the tissues

with which it comes in contact. Injuries and wounds of the genito-urinary tract are particularly liable to septic infection. Free drainage is often impossible.

Renal conditions, both functional and organic, bear a most intimate relation to urethral fever. Few patients with urethral strictures or urinary obstruction of any form escape from a little complicating functional renal disturbance, which if long continued may become organic. This disturbance may be so slight as to escape notice. This deficiency is compensated for by the emunctory function of the skin and bowels, but when the excretory quality is diminished by hyperæmia or shock, a resulting reflex action upon the renal tissue may produce suppression of urine and uræmia. The secretion of the urine is profoundly influenced through the sympathetic nerves. Their action cannot be too completely studied. All operative manipulations upon the genito-urinary tract are particularly liable, by reflex action, to throw extra work upon the blood vessels supplying the parts, thus depriving the kidneys of their proper nutritive supply, and induce an anuria which may cause speedy death.

Urinary toxæmia bears a special relation to the general accidents which may occur in genito-urinary surgery. Many of the conditions, however, which are now attributed to the toxic products of metabolism, will, without doubt, be soon proven to be due entirely to the toxins elaborated by some micro-organism. Toxins, similar to ptomaines and leucomaines, developing in the urine and becoming absorbed, may explain the unaccountable fatal results which sometimes follow a simple instrumentation; they explain the rigors, fever, etc., which sometimes appear after the voiding of urine by a patient who has undergone a urethrotomy. Sometimes the toxæmic symptoms only appear after the lapse of a long interval or after several instrumentations, the toxins in the meantime being stored up in the system, a slight nervous shock

following the instrumentation or some other cause, inducing, as it were, an explosion with possibly fatal results.

Chronic urinary toxæmia predisposes to urethral fever. The nervous system being in a state of constant irritability even a slight shock may induce a crisis, particularly when instrumentation is not well conducted, too frequently repeated or when the patient is of an especially nervous temperament and suffers from an irritable cicatricial stricture. When these conditions exist the use of hot baths and anodynes, preliminary to urethral instrumentation, may prevent complications. Shock following urethral dilatation may be relieved by hot Whiskey or Wine of coca. These methods are also useful before instrumentation to prevent urethral fever, etc.

Urethral fever, shock, etc., when expected to follow urethral instrumentation, can generally be prevented by the administration of Urotropin a few days before instrumentation, together with Aconite ix , or Gelsemium ix . When traumatic fever occurs, Norwood's tincture of *Veratrum viride*, twenty drops in four ounces of water, given in teaspoonful doses every fifteen minutes for two hours, and then every hour until the temperature falls to 99° Fahr., acts very satisfactorily for the author. He has observed similar results with *Veratrum viride* 200.

Urinary fever includes three important elements :

(a) A nervous character ; (b) a toxæmia due to the absorption of septic material, and (c) a toxæmia resulting from the retention in the general circulation of the products of retrograde tissue metamorphosis due to the inhibition of the renal function which induces uræmia.

Lydston classifies urethral fever as follows: (1) Nervous rigors not succeeded by fever, following shortly after operation or injury. They are probably due to slight shock with resultant peripheral vasomotor disturbances. (2) Traumatic or surgical fever, due to excessive reaction from shock and perverted metabolism, in combination with the decomposition

of fibrin ferments. This is likely to be modified by a varying degree of septic infection. (3) Toxæmia following severe shock with resultant perverted elaboration of the urinary secretions and the formation of organic poisons similar to the vegetable alkaloids. Associated with this is a reflex inhibition of the renal function with uræmia and perversion of general tissue metabolism (a true typical urinary fever), sometimes accompanied by convulsions. (4) Septicæmia or sapræmia, which may be speedily fatal, or merge into general pus infection, with circumscribed and diffuse suppuration in various parts. The latter may supervene without the characteristic phenomena of ordinary sepsis. (5) Typical pus infection due to pyogenic microbes of various forms. (6) Chronic urinary fever (chronic urinary toxæmia) attendant upon long-standing obstructive urinary disease. (7) Cases of mixed type combining in varying degree the various elements of the preceding.

The nervous variety occurs in those of an apprehensive timidous temperament. The introduction of a urethral instrument, particularly as it enters the prostatic urethra, inducing vomiting with a partial or complete orgasm, with coldness of the surface of the body, and a varying degree of syncope, or perhaps a slight chill, followed by flushing and perspiration of the general surface which disappears in a few moments; within twenty-four hours it may be followed by one or more severe attacks, with slight fever, sweat, and some mental depression. This passing over, they will be as well as usual. Occasionally the chill and resulting fever are more pronounced, accompanied with anuria which may extend over a period of a few days or prove immediately fatal from uræmia.

The traumatic form frequently happens within twenty-four hours after the instrumentation and is followed by high fever and profuse sweating. There may be one paroxysm or there

may be recurrences on several successive days with general depression and malaise. Those subject to malaria are particularly prone to a rise in temperature after genito-urinary manipulation.

Typical urine fever caused by some toxine entering the general system is the variety most frequently observed and only occurs after the urine has been voided and has flowed over the injured mucous membrane. It may happen even though the urethral instrumentation has been gentle and bloodless. This fever may appear as early as three to four hours after instrumentation; it may be as late as twelve to twenty-four hours thereafter. Immediately after voiding the urine—which may have produced a slight smarting sensation—there occurs a violent (occasionally mild) chill, which commences in the back and extends over the body, followed by pronounced prostration, coldness of the skin, anxious countenance, deep rings under the eyes, rapid respiration and anxious voice, nausea, vomiting, diarrhoea and rise of temperature, sometimes to 104° or 105° Fahr., pulse rapid, hard, vibrating. This condition continues for thirty to sixty minutes, when the general surface becomes red, accompanied with restlessness and thirst, and is soon followed by profuse perspiration and general relief, a normal condition being reached in twelve to twenty-four hours. During this period the urine may be suppressed and uræmic or toxæmic poisoning may cause a fatal termination. This form of urinary fever may also come on gradually, the toxins being stored in the system, when, without seeming notice, convulsions, etc., occur, and death quickly follows.

Septicæmic fever of genito-urinary origin usually commences with a slight or possibly severe chill, followed by fever. The chill generally appears soon after urethral instrumentation. The rigor gradually increases, never becoming pronounced, and is followed by a fever, which assumes a

continuous type, except as interrupted by an occasional chill. If the degree of infection is slight, recovery may occur in a week or ten days; if it is great, a typhoid state follows and death results within one or two days. In the intermediate variety the symptoms are more subacute in character and are accompanied by a general pyæmic condition with the development of small foci of pus in different parts of the body.

The chronic form of urine fever consists of a combined chronic toxæmia and nervous irritation due to a long-continued obstruction to the urinary stream and an inflammatory state of the genito-urinary tract. It often happens in the elderly who are suffering from the various forms of chronic cystitis resulting from stricture of the urethra, prostatitis, vesical growths, pyelitis, calculi, etc. It presents a mild type of fever (flushing of the face, slight elevation of temperature, followed perhaps by some sweating), with nervous irritability, mental depression and drowsiness, obscure rheumatic and neuralgic pains in various parts of the body, general loss of strength and flesh, together with digestive disturbances of various kinds dependent upon the imperfect elimination of the products of retrograde metamorphosis and a varying amount of absorption of the morbid material, the product of the inflammatory condition, and the decomposition of the residual urine, which causes slow undermining of the system and finally death.

The mixed forms include those which have, in a varying degree, the combined symptoms of two or more of the six forms already described.

In the field of genito-urinary surgery the following eight procedures should receive special attention: (a) Asepsis in every operation; (b) establishment and maintenance of free and perfect drainage; (c) irrigation; (d) copious diuresis; (e) free movement of the bowels; (f) the proper action of the skin; (g) physical and sexual rest; (h) avoidance of all after-treat-

ment likely to injure the newly-formed granulation tissue, and gentleness in all manipulations of the diseased area.

(a) Asepsis.—When the proposed surgical procedure involves the bladder, perineum or scrotum, on the morning of the day previous to the operation, the parts must be carefully shaved, scrubbed with hot water and green soap, using a large sterile gauze pad, bathed in Alcohol, and douched with an aqueous solution of Bichloride of mercury, 1-1000, and protected until the time of operation by sterile gauze dampened with a 1-2000 solution of the same, or a saturated solution of Boric acid. Immediately preceding the operation, the parts must be again scrubbed with soap and water, washed with Lime, Soda and hot water, or Electrozone, and finally douched with sterile water. Preparations for surgical procedures on the prepuce and glans penis can be made immediately preceding the operation. For the week previous to a urethral or vesical operation, Urotropin in seven and one-half grain doses, three times daily, should be internally administered, for the purpose of rendering the urine sterile. This precaution should also be continued during the after-treatment. Methylene blue, Salol, Boric acid, oils of Wintergreen, Sandalwood or Eucalyptus, Benzoate of soda, etc., may be substituted. To prevent urethral fever, one gram capsules of Camphoric acid should be given three times a day for the forty-eight hours previous to the operation. In the after-treatment of a urethrotomy, the internal antiseptic should be continued for some time and the urethra irrigated, both before and after instrumentation, with a mild antiseptic solution.

(b) Drainage.—In genito-urinary operations, free drainage must always be instituted and maintained. While many brilliant results have followed closure of the wound without drainage, micro-organisms—though the strictest of precautions have been enforced—have sometimes been inclosed and produced dire results. Complete and well-planned drainage

removes the toxins elaborated by micro-organisms which may be present, gives rest to the parts and facilitates rapid healing. When perineal or supra-pubic drainage tubes are necessary they should be connected by means of a short piece of glass tubing with a sterile rubber tube, about one-third of an inch in diameter, passing over the side of the bed, terminating at the bottom of a sixteen-ounce bottle containing four ounces of a solution of Bichloride of mercury, 1-1000, or Carbolic acid, 1-30, thus preventing ascending infection. To facilitate noting of the quantity of urine voided, a piece of adhesive plaster should be vertically attached on the outside of the bottle and marked to indicate the ounces. The drainage tube can be prevented from dragging, by fastening it to the sheets with safety pins. When vesical drainage has been instituted and bleeding within the bladder occurs, the resulting blood clots may obstruct the tube. They should be allowed to remain undisturbed for twelve hours, since too early manipulation of the parts is liable to induce irritability of the bladder wall and bring about spasmodic contraction. After twenty-four hours, blood clots of themselves disintegrate and can be easily washed out. If, however, pain becomes excessive, an ounce or so of a warm solution of Lloyd's Hydrastis, or of Hamamelis 1-10, may be injected through the drainage tube to dislodge the clot. If a surgical operation upon the bladder or urethra is followed by excessive bleeding, it may often be controlled by the injection of a 1-1000 to 1-5000 solution of Adrenal extract.

(c) Irrigation.—Twenty-four hours after operations necessitating bladder drainage, the vesical cavity should be thoroughly douched with the selected mild antiseptic solution at a temperature of 104° Fahr. Bichloride of mercury acts kindly when the urine is ammoniacal; Boric acid is generally employed, though Thiersch's solution is often beneficial. If a purulent condition continues, Nitrate of silver, one grain to the pint

of water, is often very efficacious, though its use sometimes causes excessive pain. Borolyptol, 1-10, is very useful and generally acts well, though, like everything else, with the exception of Bichloride of mercury, it does not give very satisfactory results in tubercular conditions.

(d) Diuresis.—The condition of the kidneys is of the utmost importance. Their proper functional activity governs, in a great measure, the success or failure of the genito-urinary operation. The urine must always be carefully examined, and during the preparation of the patient, if evidences of pus formation within the genito-urinary tract are present, Camphoric acid, one gram in capsules, seven and one-half grains of Urotropin, or some other good internal urinary antiseptic, should be administered, four times a day, together with copious draughts of water. If the urine appears normal, the urinary antiseptic precaution and the increase in the emunctory function of the kidneys by large quantities of water may be curtailed to two days. The normal quantity of urine voided by the average man varies from forty to forty-eight ounces a day; a persistent increase may indicate the effect of diuretics, impairment of the general system, particularly in the nervous sphere, interstitial nephritis, diabetes mellitus. When due to any one of the last three conditions the prognosis should be guarded. The diabetic condition, with its liability to coma or heart failure, contra-indicates surgical procedures unless urgently necessitated. When imperative, the patient should remain in bed for a week previous to the operation, kept on a milk diet and the mind put at ease. After a surgical operation, if the daily quantity of urine voided does not exceed forty-eight ounces, it should be regarded as unsatisfactory; polyuria amounting even to one hundred ounces a day is not objectionable, as the urogenital tract is more completely flooded at each micturition and thus any germs present may be dislodged and washed out. The time, quantity and gen-

eral characteristics of each micturition must, for the guidance of the surgeon, be carefully recorded. Diuresis, which is of extreme importance, can, in the majority, be induced by the daily ingestion of an excessive amount of soft spring water (Poland, Stafford or Peperill), milk or buttermilk. To facilitate recovery when the genito-urinary organs are diseased and to keep them in healthy condition, it is necessary to maintain a normal and non-irritating urinary secretion. The reaction of the urine varies somewhat according to the food and drink ingested, and upon nervous strain. The urine to be non-irritating must be faintly acid or neutral in reaction, free from sharp crystals and not too concentrated. The condition of the urine may be controlled by diet, physical exercise, general hygiene of the skin, stomach and lungs. Pure water must be taken in sufficient quantities to keep the urine of proper specific gravity. Lemon juice, all condiments, especially salt, pepper and mustard, must be interdicted. Asparagus, celery, rhubarb and tomatoes tend to increase the acidity of the urine, thus they irritate, in a varying degree, the urethra, and therefore in all acute and in many chronic conditions should be interdicted. The acidity of the urine can often be greatly reduced by a vegetable diet. A milk diet is always indicated, though there are few who can continue it for any length of time. If the patient will live upon bread and milk the urine will soon become neutral or faintly alkaline. The alkalinity may be maintained by appropriate doses of Citrate or Acetate of potash. Alcoholic fluids, being largely eliminated by the kidneys, have a singularly pernicious effect upon the genito-urinary tract. Beer, champagne and Burgundy are particularly bad. Whiskey and brandy irritate to a less degree. Tea, coffee and tobacco should if possible be avoided, though their disuse is not so essential as is that of alcohol. The admixture of bacteria and their products frequently makes

the urine irritating in character and often necessitates control by internal and local urinary antiseptics. If there is anuria, due to the effects of the anæsthetic or other reasons, and the stomach will not retain fluids, one or two quarts of a hot normal saline solution may be injected into the colon through a long rectal tube, and repeated if necessary every six to twelve hours. If the condition is critical, transfusion or the sub-cutaneous injection of a quart of a normal saline solution at 110° Fahr. may be required to properly stimulate the emunctory function of the kidneys. Counter-irritation over the renal region in both imperfect urinary elimination and suppression is sometimes useful. Cups, blisters or electricity may be applied, but usually hot poultices made of ground Flaxseed, Digitalis leaves, hot turpentine stupes, dry hot air or steam are employed. As a general diuretic, the following acts well: Sweet spirits nitre, dr. ss.; Acetate potash, gr. xx.; Aqua, oz. iv. To be repeated every three to twelve hours. Anuria from reflex cause is not generally lasting. When due to urinary obstruction it may call for immediate surgical relief, but when due to renal disease, operative methods are generally contra-indicated.

The presence of albumin must always be noted, though when casts are absent and the specific gravity keeps above 1015, it is probably of extra-renal origin.

In threatened suppression the internal administration of Mercurius dulcis is often very efficacious. It may be given in a single dose of ten grains, but it acts best when given in one-tenth grain tablets every hour for six to twelve doses. Its administration should always be followed by a saline cathartic, such as Rubinat or Hunyadi water. If the heart action is weak, infusion of Digitalis, Whiskey, Carbonate of ammonia, Strophanthus or Nitroglycerine may be required. If the nerve force is low, Strychnine, from one-sixtieth to one-twentieth of a grain, hypodermatically, every two to six hours,

may be useful. When the element of shock or chill is associated, hot packs are effectual.

(e) The Bowels.—The bowels must be stimulated to free activity and constipation never allowed to continue. If the indicated remedy is not sufficient, recourse must be had to saline mineral waters, some preparation of Cascara, or Compound licorice powder. The intestines should be carefully evacuated and cleansed by enemata for the week previous to the date of the operation.

If the patient is comatose, in conjunction with the general treatment already described, the bowels should be moved by placing two or three drops of Croton oil, mixed with six of Olive oil, upon the back of the tongue.

(f) Skin.—The skin should be encouraged to do its full emunctory work by Turkish, or even hot general or sitz, baths. If fever is present, sponging the body with cold water or spirits, rest in bed and a hot foot bath may be beneficial. Chilling of the general surface is always dangerous. Exposure is often responsible for relapses and intercurrent complications.

(g) Physical and Sexual Rest.—The complete rest which is possible in the majority of general operations is often impossible in genito-urinary work, but all possible physical inaction must be observed, and whenever they can remain in bed it will always be beneficial.

Success or failure in the management of diseases of the genito-urinary tract often depends upon the comprehension and application of urethro-sexual hygiene.

Sexual rest is unfortunately extremely difficult, as all unmarried male adults have many uncontrollable erotic fancies and suffer from ungratified sexual hunger, which is augmented by those conditions of modern civilization present in suggestive pictures and objects, exciting books and impure conversation. Sexual excitement from these causes cannot

be relieved by fornication, which is always irregular, excessive and very unsatisfactory. Masturbation is degrading and often undermines the general health, and nocturnal pollutions, while relieving, are inadequate. Normal marital relationship is the only standard which permits of the possibility of perfect sexual quietude. Ungratified sexual desire is often responsible for many derangements, not only of the genital but of the general system. Continued mental incontinence not infrequently causes more serious conditions than follows the perverted habit of masturbation. For those who are debarred from entering a proper matrimonial state, good literature, wholesome plays, refined society, absolute sexual continence, pure thoughts, avoidance of temptation, increased gymnastics, outdoor exercise and a non-stimulating diet, must be advised.

(h) After-treatment.—Injury to new-formed granulation tissue should be avoided by extreme care in all instrumentation immediately following operation.

In the examination of chancres, chancroids, etc., the parts should be covered with a piece of thin rubber sheeting, as this protects the surgeon from infection while it does not interfere with his sense of touch.

In making digital examination of the rectum the patient should lean forward over the arm of a chair, making the bend at the hips and keeping the knees straight; the index finger of the right hand of the surgeon should be protected by a rubber finger stall which should roll over a piece of toilet paper wound around the base of the finger to protect the other fingers and hand. Vaseline should be used as a lubricant.

SECTION II.

THE ANATOMY, ANOMALIES, INJURIES AND DISEASES OF THE PENIS.

Anatomy of the Penis.—From its anatomical construction it is evident that the penis is a genital organ to which the urinary function is subservient. The average penis in a state of repose is about three inches in circumference and from two and one-half to four inches in length, increasing to from five to seven inches during erection.

The penis is made up of three essential component parts—the two corpora cavernosa, placed side by side, and the corpus spongiosum below and between them—surrounded and bound together by the strong fascia of Buck and covered by integument.

The corpora cavernosa arise one on each side from their respective tuberosities and ascending rami of the ischii; passing upward, forward and inward they meet beneath the symphysis pubis, from which point they continue forward side by side to form the larger portion of the penis. They terminate in blunt ends which are completely covered by the expanded extremity of the corpus spongiosum.

The corpora cavernosa are composed of spongy erectile tissue which during the erection of the penis, becomes distended with blood, each corpus being surrounded by a dense fibrous sheath of great strength supplied with an abundance of elastic tissue which permits the parts to adapt themselves to their various functions. The anterior portions of the approximating sheaths of the corpora cavernosa are perforated by numerous apertures which allow of interchange and, during

erection of the penis, of equalization of the blood pressure in the tissue.

The corpus spongiosum is also composed of erectile tissue surrounded by a fibro-elastic sheath, but its blood canals do not communicate with those of the corpora cavernosa. The corpus spongiosum surrounds all that portion of the urethra situated in front of the triangular ligament. It expands anteriorly to form the glans penis which covers the conical extremities of the corpora cavernosa. The flange-like expansion or raised border at the base of the glans penis is called the corona glandis, and the depression behind it the coronary sulcus. The glans penis is covered by a semi-mucous membrane, having small-sized epithelia, minute papillæ (Harn), and large and numerous so-called sebaceous glands (Tyson), particularly abundant about the frenum, which secrete a white pungent material (smegma). This may, even in the most cleanly, collect behind the corona glandis and excite inflammation. The particular function of the glans penis is to furnish a soft expanse of surface for the distribution of the terminal filaments of some of the nerves of sexual sensibility. Posteriorly the corpus spongiosum terminates in an expanded end lying in the angle formed by the two converging crura of the corpora cavernosa; it is attached to the lower surface of the triangular ligament, and is known as the bulb. The function of the corpus spongiosum is essentially to expel the last drops of urine or semen from the urethra after the fluid has been thrown into the anterior portion of the canal by the contraction of the prostate, levator ani, compressor urethræ and other deep urethral muscles. Contraction of the accelerator urinæ muscles forces the blood in the bulb forward through the spongy tissue of the corpus spongiosum, producing a wave-like enlargement of the latter and a forcible compression of the urethra from behind forward which expels any contained fluid.

The muscles of the penis are the accelerator urinæ, the unstriped muscle fibres of the urethra, the erectile tissue and the erector penis. The accelerator urinæ arises from the central perineal point, passes upward and forward, encircling the bulb and posterior part of the penile portion of the corpus spongiosum. Its function in expelling the blood from the bulb and completing the discharge of the contents of the urethra has already been described. The erector penis muscles arise from the ishiatic tuberosities and are inserted into the lower side of the fibrous sheaths of the corpora cavernosa. Their function is to compress the veins and increase the turgescence of the penis during erection. They have little to do with mechanically changing the position of the penis.

The three component segments of the penis are bound together by a tough fibrous investment known as Buck's fascia. This arises by a triangular bundle of fibres known as the suspensory ligament of the penis, from the symphysis pubis and from the pubic rami at the attachment of the anterior layer of the triangular ligament, the lower plane of the fascia posteriorly being continuous with the deep perineal fascia. From its origin the fascia passes forward and surrounds the corpora cavernosa and the corpus spongiosum. The cavity inclosed by Buck's fascia is bounded anteriorly by the glans penis and posteriorly by the triangular ligament. Separating this dense fibrous capsule from its enveloping integument, is a considerable layer of loose connective tissue which contains no fat but which allows of the greatest latitude of motion.

The integument of the penis differs from that of the body in general, only in its tendency to pigmentation after puberty. Over the glans penis it folds back upon itself to form the prepuce or foreskin, a non-adherent protection for the sensitive glans. The inner surface of the prepuce is of a delicate semi-mucous structure separated from its outer skin layer by a very loose cellular tissue which permits of the entire efface-

ment of the space between the layers when the foreskin is retracted. The point of junction of the two layers is called the preputial orifice. When the penis is in repose the foreskin covers the glans penis; during erection, however, it is generally retracted. The prepuce is attached to the lower angle of the meatus urinarius by a triangular fold of mucous membrane, the frenum, which contains the frenal artery.

The arterial supply of the penis is from branches of the internal pudics. The veins and lymphatics are located along the dorsum and receive branches from the corpus spongiosum. The lymphatics lead mainly to the lymphatic glands above Poupart's ligament.

ANOMALIES OF THE PENIS.

The size of the penis bears no special relation to the stature of the individual, the strong robust athletic man often possessing a small organ, while the penis of the congenital dwarf or hunchback is frequently over-developed. In a recent case of the author's, a child of eight, of usual mental and physical status, presented a penis and other genital organs ordinarily expected in a man of thirty-five. A large penis is not only a source or danger in promiscuous intercourse, as it is easily abraded, but it may make coitus painful or even impossible. The flaccid organ is no criterion of the size which it may attain when fully erected; a small penis may increase greatly in bulk while a large one may expand but little. Micro-penis sometimes happens. All adult penes less than two inches in length are to be classed as such. Normal sexual intercourse generally occasions proper development, unless the small size of the organ is due to excessive masturbation.

Deformities of the penis, unless associated with other malformations of the genitalia, are rare. Dumarquay reports the case of a man twenty-seven years of age in whom the urethra

opened into the rectum and the penis was represented by a small wart-like growth in the perineum, which, during sexual excitement, became distended with blood, and when the cause of the sensation was continued for a sufficient length of time spermatic fluid was discharged through the urethra.

Concealed or congenital dislocation of penis sometimes exists; it has been mistaken for absence of the organ, the penis, destitute of integumental covering, being located beneath the skin of the abdomen, skin or thigh. When it happens, the skin should be incised and the organ liberated. Hart's case of double penis is classical and well-known. Both organs were four inches in circumference, became simultaneously erected under sexual excitement and, during the act of micturition, urine was voided from each. When double penis exists the organs are generally fused to a varying degree. Adhesion of the penis to the scrotum by a web is not uncommon, it materially interferes with coitus. The organ should be entirely freed by surgical procedure.

Torsion of the Penis.—This condition is common when associated with epi- or hypospadias. It sometimes occurs without accompanying urethral defect. Congenital incurvation may exist.

TRAUMATISM OF THE PENIS.

Contusions of the Penis.—When injury of the organ from traumatism without special lesion of the integument occurs, ecchymosis and swelling may, owing to the large size of the superficial veins and the laxity of the connective tissue, rapidly appear. If the vessels of the corpora cavernosa are ruptured, a sub-cutaneous, circumscribed, fluctuating tumor will develop, deforming the penis, especially when in the state of erection. The tumefaction may slowly subside or possibly terminate in suppuration or gangrene. If the urethra is lacerated, blood will ooze from the meatus. When the con-

tusion is extensive, pronounced symptoms of local inflammation rapidly develop.

Treatment.—Rest, elevation of the parts, and the application of evaporating lotions, such as tincture of *Calendula*, a teaspoonful to a pint of hot water, or a hot solution of Bichloride of mercury, 1-10,000, are advisable, the latter being especially indicated when a gangrenous termination is probable. Internally, *Aconite*, *Belladonna*, *Arnica*, or *Hypericum*, as indicated. If the local conditions are not relieved emphysema will develop.

Interference with the Circulation of the Penis.—The tying of a string or other substance around, or slipping a ring over the organ to induce artificial erection, prevent pollution, or nocturnal urinary incontinence, etc., is often followed by speedy and serious results; *e. g.*, the penis anterior to the point of constriction becomes œdematous, cold, glistening and tense, the swelling being so marked that the constricting band is sometimes located with difficulty and scarification may be necessary to reduce the swelling sufficiently to allow the band to be cut. If it is not removed gangrene may result.

Wounds of the Penis.—These are classed as incised, lacerated, contused and punctured. Incised wounds, when superficial, are unimportant and heal rapidly; when deep, especially if transverse and involving the erectile tissues, they bleed profusely and may even prove fatal. When the divided structures unite, loss of erectile power anterior to the line of union is frequent. Lacerated and contused wounds are dangerous only when the traumatism is so extensive as to cause death of the tissues of the organ or when the urethra is involved. Mutilation of the parts may be followed by impaired erectile power. Punctured wounds are not important unless they become inflamed or infected.

Mutilation of the penis by those afflicted with some unnatural religious emotion, melancholia, remorse from inability to

properly curb the sexual desire, etc., is not infrequent. Disfigurement to make eunuchs is a common practice in the orient and in some of the Australian tribes the penis and urethra are mutilated to remove the ability to properly deliver the semen, lest it might cause impregnation, during coitus.

Treatment.—Excessive bleeding must be controlled by the ligation of the divided vessels or by a suture thrust through the fibrous sheath of the erectile tissue. It may be necessary to introduce an English catheter into the bladder and control the hæmorrhage by a roller bandage snugly applied around the organ for several hours. Erections, which retard union, may be controlled with one or two drachms doses of Potassium bromide, Opium and Belladonna rectal suppositories, or Morphia hypodermatically at bedtime. Endeavor should always be made to save the organ, even if the contusion is extensive. If the urethra is severed, its ends should be brought into apposition and sutured with catgut, and the urine evacuated by means of continuous catheterization, which should be maintained for from five to seven days, followed later by proper urethral dilatation with steel sounds. External wounds should receive appropriate surgical care. Arnica, Calendula and Aconite, as indicated, materially hasten recovery.

Fracture of the Penis.—The continuity of the corpora cavernosa is sometimes broken by violence during coitus, by suddenly turning on the erect penis in bed, etc. Pain and distension from extravasated blood constitute the early symptoms. Sometimes there is a sensation of heat and weight. If immediate attention is not given, the effused blood may, by pressure from without, cause temporary occlusion of the urethra. If the fracture is complete, rubbing the ends of the separated parts together will give a distinct fremitus, and a sulcus will appear when the organ is extended. Fractures of the cavernous bodies generally unite, and are followed by perfect return

of power in the organ, sometimes though, with the same treatment, the distal end of the organ remains ununited and flaccid.

Fracture of the corpus spongiosum may be produced by a blow upon the curved penis ; as formerly advised in chordee, it may also occur accidentally and induce a varying degree of immediate hæmorrhage with resulting traumatic stricture of the urethra.

Treatment.—Fractures of the penis demand the recumbent position, catheterization and cooling applications, or the introduction of a straight woven English catheter upon which the penis should be firmly bandaged. In the more severe traumatisms, free incision may be necessary, with the use of the catheter ; later, systematic dilatation with steel sounds, or, possibly, a urethrotomy.

Dislocation of the Penis.—This is a very rare accident. It is always induced by violence from without, *e. g.*, the integument of the organ being violently dragged upon as in a fall, during a railway accident, being caught in powerful machinery, etc., etc. The mucous membrane of the prepuce gives way either at the meatus or along the line of the coronary sulcus, the urethra is generally ruptured in the perineal region and the body of the organ is forced into the groin, scrotum, upon the pubes or into the abdominal region, where it is easily outlined beneath the skin. Invagination of the cutaneous layer of the penis occurs, the large cavity previously occupied by the penis is soon filled with blood and blood clots ; on casual examination only a shrunken condition of the parts may be noticed. The true nature of the penile injury is frequently not discovered until urinary retention, or the discharge of urine from an opening some distance from the penis, directs attention to the true condition. Blood usually issues from the preputial orifice, and, unless the accident is remedied by appropriate surgical methods, urinary extravasation into the perineal or scrotal regions soon follows.

Treatment.—A free incision should be made immediately over the dislocated organ through which the displaced parts can be replaced. If rupture of the deep urethra and urinary extravasation have occurred an external urethrotomy will be necessary.

ACUTE INFLAMMATIONS OF THE PENIS.

Acute Non-Venereal Inflammation of the Penis.—A local or diffuse inflammation of the penis sometimes occurs. It may attack the subcutaneous cellular tissue, which, due to its anatomical conformation; may become greatly œdematous, swollen and gangrenous, be confined to the erectile tissue or involve both. When diffuse the inflammatory process may involve the superficial tissues as an erysipelatous inflammation, penitis, or invade the erectile tissues and constitute a cavernitis. It is usually due to traumatism, urinary extravasation, inflammatory phimosis or paraphimosis, acute fever, sexual excesses, etc.

Treatment.—When localized, hot antiseptic fomentations, with elevation of the parts, and Aconite, Arnica, Belladonna, Hepar sulph., etc., are usually indicated; if pus forms, evacuation, drainage and general surgical care, with Silicea, Hecla lava, or Sulphur. The methods outlined for the local variety are applicable to the diffuse unless gangrene threatens or the deeper structures become involved. When the disease slowly develops, compresses saturated with a solution of Bichloride of mercury, 1-10,000, at 110° Fahr., changed every few minutes, the hypodermatic injection into the surrounding tissues of Phenic acid, 1-80, or spraying the parts every two hours with the same may be beneficial. Long-continued, general, or hip baths of Bichloride of mercury, 1-40,000, or a strong solution of Boric acid, sufficient to cover the parts, have been very successful. When the disease is fulminating in character, the dead tissue should be removed and the

parts curetted, cauterized with the actual cautery and covered with strips of gauze wrung out of hot Bichloride of mercury solution, 1-10,000, or a 20 per cent. solution of Electrozone. Bromine, 1-500, is often useful in facilitating healthy granulation, when Iodoform or other antiseptic dusting powder should be substituted. Echinacea, Lachesis, Arsenicum album, etc., are serviceable for the constitutional symptoms.

Lymphangitis of the Penis.—This condition may be venereal or non-venereal. In the venereal variety the lymph vessels along the dorsum of the penis become inflamed, thickened and feel like small cords beneath the skin; at points along their course small nodular masses may be outlined which may terminate in resolution or suppuration. Non-venereal lymphangitis is rare. It is usually the result of traumatism such as occurs during coitus. The lymphatics of the prepuce become distended without marked inflammatory changes, and the retracted prepuce presents numerous semi-transparent lymph vessels which pass upward and backward over the dorsum of the organ. The swelling usually subsides within a few days; it may persist and produce local inflammation and thickening of the prepuce.

Treatment.—Rest, elevation of the parts, and the application of hot compresses composed of tincture of Hamamelis or Calendula, 1-16, or prolonged emersion of the parts in the same solution. In the chronic variety an ointment composed of Ungentum hydrargri ammoniatum, ten grains to the ounce of Vaseline, or one part of Belladonna and Mercurial ointment to four parts of Lanolin, rubbed in daily along the course of the swollen vessels may cause them to return to their normal condition. Removal by surgical procedure may be necessary. When pus forms it must be evacuated and the cavity surgically dressed. The remedies useful are Aconite, Apis, Sulphur, Silicea, Hepar sulphur and Echinacea.

Phlebitis of the Penis.—This lesion occurs as a complica-

tion or a sequela of some other disease of the penis or the urethra. It is characterized as a tense indurated cord located along the course of the dorsal vein of the penis, passing upward along the middle line of the penis, but does not extend over the groin as in lymphangitis. Furthermore, this swollen vein cannot be lifted out of the groove between the corpora cavernosa as can the swollen lymphatics.

Treatment.—Evaporating Hamamelis lotions, rest, elevation of the parts, with the administration of Hamamelis, Apis, Pulsatilla, Aurum, etc.

Eczema of the Penis occasionally occurs. It is extremely rebellious to treatment, which must be conducted along the lines common to the same condition in other parts of the body.

Chronic Œdema of the Penis.—This condition is generally a symptom of general anasarca when it is practically overshadowed by the accompanying scrotal œdema. It may be due to some local obstruction to the return of the venous blood. The œdema is most pronounced in the prepuce and frenum; it may be so extensive as to impede urination.

Treatment.—Elevation of the parts together with cold evaporating applications or painting them with Collodion may be successful. Multiple puncture or dorsal incision may be necessary.

Gangrene of the Penis.—This disorder, independent of local inflammation, may happen spontaneously during the invasion of the general system by the exanthematous, typhoid, typhus and intermittent fevers, small-pox, diabetes, persistent priapism, iliac thrombosis, exposure to cold, acute alcoholism, etc.

Treatment.—Incision of the inflamed and œdematous areas, hot antiseptic applications and later plastic work as necessary.

Neuralgia of the Penis.—This derangement may be considered to be of a gouty character. The pain may be paroxysmal or continuous, and is generally referred to the meatus, the

urethra or the entire organ. While the penis may be free from demonstrable pathological lesions there is generally a history of previous urethral disorder, a gouty diathesis and a neurotic temperament.

Treatment.—Attention should be directed to the improvement of the general condition; the sexual and urinary hygiene should not be neglected. Oxalic acid, Berberis, Benzoic acid, Clematis, Pulsatilla, etc., are often prescribed with benefit.

Gout of the Penis.—Sir J. Paget records a case of an elderly gouty man, with recurring attacks of great swelling, pain and redness of the penis, attended with urethral discharge, which accompanied gout in other parts of the body. All symptoms disappeared quickly under treatment for gout.

MUCO-CUTANEOUS LESIONS OF THE PENIS.

Balano-Posthitis.—Balanitis (Βάλλανος, a gland) is the term applied to inflammation of the surface of the glans penis and posthitis (πρόσθη, the prepuce) to inflammation of the mucous lining of the prepuce; as one cannot continue for any length of time without producing the other, they are described together. The disease itself is not contagious unless of venereal origin.

Etiology.—Predisposing causes: A long, tight, redundant, or a very short prepuce, a short frenum, neglect of proper genital toilet, a gouty or strumous diathesis, diabetes, and many of the contagious diseases. Exciting causes: Traumatism, masturbation, sexual excesses, irritating applications, the abnormal and excessive secretion of smegma from the glands of Tyson, or contact with some infectious material, as the ordinary pyogenic bacteria present in the menstrual, leucorrhœal, lochial or other irritating non-venereal uterine or vaginal discharges. When it is caused by the morbid infection of gonor-

rhœa, chancroid or syphilis it may assume a special form. It may be the result of a mixed infection.

Clinical History.—Balano-posthitis may be acute or chronic. It often recurs. When acute in character, the inflammation begins at the corona glandis and extends forward on both balano and preputial surfaces. The symptoms vary from a slight itching, uneasy feeling of the glans, with some redness or slight abrasion of the parts and a yellowish or greenish-yellow discharge, to a condition in which the invaded mucous membrane is swollen and œdematous, of a dark bluish-red or mottled cast, with irregular erosions of its epithelium, especially in the region of the corona, and a profuse greenish, purulent, offensive discharge. The formation of crusts on the exfoliating area may follow. Ulcers may develop under the crusts and appear very like chancroids. The prepuce may become inflamed and infiltrated with serum. If a long foreskin exists, an inflammatory phimosis may result. If the resisting power of the system is at a low ebb and the balanitis of high degree, perforation of the prepuce may occur, and the glans present itself in the opening. As the urine passes over the parts, it gives rise to burning and biting in proportion to the degree of inflammation. The associated inguinal glands often become enlarged and sensitive, but rarely suppurate. The circinate erosive form is characterized by its ringworm configuration, by being infectious and often resisting all treatment. In the diphtheritic variety, in addition to the general symptoms of an ordinary balano-posthitis, the mucous membrane is covered with a thick, dirty yellow, adherent membrane; when removed, it is followed by slight bleeding. In the venereal form the foreskin becomes thick, cold and purple in appearance and there is pronounced infiltration of the deeper tissues. In diabetes this is sometimes one of the most distressing and early symptoms of the disease. It is caused by the contact of the saccharine

urine with the exposed preputial surface. Friedrich has isolated a characteristic fungus which he considers to be responsible for the condition. Hebrews escape this variety of balano-posthitis through circumcision.

Vegetations, hypertrophies, gangrene, lymphadenitis, etc., may complicate balano-posthitis in those who neglect the proper toilet of the parts and where the original lesion has been improperly treated by caustics or irritants.

Chronic balano-posthitis often happens in middle and advanced life, it is recurrent in character, dependent on diet and habits, and produces a varying degree of itching and heat of the end of the penis, which may become quite distressing and cause frequent and painful erections. The mucous membrane of the preputial sac becomes inflamed, thickened and covered with a little pus. As the induration of the prepuce advances, it often, by pressure, produces marked diminution in the size of the glans; it may involve the entire sac or be limited to special areas. The chronic inflammation sometimes results in some adhesion of the opposed membrane; during coitus the adhesions and thickened membrane are often slightly torn, favoring infection, etc.

Diagnosis.—In balanitis there are no urethral symptoms; the secretion present does not come from the urethra. Herpetic eruptions commence as vesicles, which soon break down and leave round erosions. Chancroids have distinct ulcerations, early inflammatory infiltration and bubonic complications. Balanitic lesions bear no special relation to sexual intercourse; chancroids appear in from one to five days after inoculation. Chancre is hard, circumscribed and indurated, with glandular involvement, and is followed by secondary lesions. Chronic balano-posthitis is easily recognized by its clinical history.

Prognosis.—The condition is generally easily relieved, though it will return unless the cause is removed, which some-

times, as when due to diabetes and gout, is impossible. In advanced age, the balanitic patch sometimes takes on an epitheliomatous degeneration.

Treatment.—Cleanliness is of the first importance, as without it recovery cannot ensue. Alkalies, soaps, salves, etc., irritate and must be avoided. The inflamed area should be bathed with an aqueous solution of either Carbolic acid, 1-400; Bichloride of mercury, 1-5000; a saturated solution of Boric acid; Succus calendulæ, or Lloyd's Hydrastis, 1 to 10. When ulceration is present, the selected mild applications should be preceded by a douche of a 30 per cent. solution of Hydrogen peroxide. If the parts can be exposed they should be dried with absorbent cotton without rubbing. If the prepuce cannot be retracted, a cleansing and antiseptic solution should be injected with a broad-nozzled syringe in to the balano-preputial cavity and retained for about a minute. The dried surface should be dusted by the aid of a dry camel's hair brush from which the powder can be easily shaken, with pulverized Amyli and Zinc oxide, equal parts; Subnitrate of bismuth, Calomel, Tannin, Aristol, Nosophene, etc., or separated by a thin layer of absorbent cotton moistened with red wash or Liquor plumbi subacetatis. The parts should be redressed two or three times daily, according to the severity of the disease. The penis should be carried above the pubes and held in place by two lateral pads pinned to a T-bandage or a jock strap. Where erosions are present, a solution of Nitrate of silver, 1-2000, acts very kindly; the daily application of a ten- to sixty-grain to the ounce solution may sometimes be required. Lime water and aromatic wine are often beneficial. In the diphtheritic variety, perfect antiseptics and the local application of Tincture of iodine, and in obstinate chronic cases, lotions of Zinc chloride, one-half to two grains to the ounce of water, or Tannate of glycerine are often very efficacious. In diabetic balano-posthitis, if the

sugar in the urine can be reduced by general treatment, relief from the itching and excoriation of the parts will ensue ; if not, bathing the parts with the following solution : Hydrarg. chlor. corr., gr. ss. ; Acid carbolic, m. xx. ; Aqua, oz. viij., is to be recommended. If inflammatory phimosis is present, frequent and prolonged immersion of the affected parts in hot water, made slightly aseptic, will be necessary. In many of the chronic or relapsing cases, relief will only be obtained by circumcision. When of chancroidal origin, and where the foreskin cannot be retracted, lateral incision of the prepuce must be performed (see inflammatory phimosis). The gonorrhœal and leucitic varieties of balanitis respond to the appropriate local and general treatment.

The following remedies are most frequently indicated :

Arsenicum album is often curative in the circinate or diabetic balano-posthitis.

Cannabis sativa is required in balano-posthitis of gonorrhœal origin. The glans is red, covered with dark spots ; the preputial opening excoriated ; the prepuce dark red, swollen and inflamed ; moisture around the corona ; burning and corrosive pains in the parts.

Cantharis.—Gonorrhœal balano-posthitis ; glans swollen, inflamed, painful and itching ; prepuce red, hot, swollen and shining ; phimosis with discharge of purulent matter ; brown cheesy accumulation behind the corona glandis in the morning.

Cinnabaris.—Red spots on the glans penis as if pimples would form, with itching, stitching and burning of the corona glandis and fossa behind it, relieved at first by rubbing, followed by increase of local irritation and the exudation of a nauseating sweetish-smelling pus.

Lycopodium.—This remedy is useful in the lithæmic variety. Yellow exudation behind the corona glandis ; prepuce red, inflamed, with great itching of the inner surface and frenum.

Mercurius solubilis Hahnemanni or *corrosivus*.—Glans and prepuce swollen and inflamed, covered with a fine red eruption, or cracked and chapped, accompanied by burning, biting, itching or voluptuous pain; profuse muco-purulent discharge; prepuce swollen as if distended with water.

Mezereum.—Often necessary for the cure of balanitis of those advanced in age. In obstinate cases with profuse discharge. Fossa behind the glans excoriated, with burning, tearing, lancinating pains; itching in the prepuce, particularly after urinating.

Nitric acid.—Glans covered with scurfy spots; denuded spots, with itching, throbbing and pressure; itching, tickling like the bites of small insects within the prepuce; phimosis without much redness; ulceration of the prepuce and margins of the meatus urinarius; all erosions bleed easily.

Natrum carbonicum.—Glans and prepuce inflamed, swollen and sore; smegma behind the glans, accompanied by burning, itching and stinging pains.

Natrum muriaticum.—Red elevations on the glans; redness around the meatus; biting and itching in the glans, particularly after urinating; prepuce retracted, causing a dry sensation; itching of the corona, with moisture; offensive discharge from the glands of Tyson; jerking, throbbing, rhythmical pains in glans and prepuce.

Nux vomica.—Gouty balanitis; soreness, burning, biting and itching in the glans, especially after urinating; prepuce retracted behind glans; margin of corona somewhat sore, with burning, biting, itching on the under surface of the prepuce; increased smegma behind the corona; all symptoms worse at night.

Uranium nitrate and *Phosphoric acid* are sometimes beneficial in the diabetic variety.

Preputial Calculi.—These concretions are produced by deposits of the salts of the urine on or around the corona. They

vary in size from a millet seed to a small hen's egg, and occur especially in children with long prepuces (congenital phimoses). They may exist for years, finally giving rise to a purulent discharge. They should be removed and the patient circumcised.

Varices of the Prepuce.—This condition may be either congenital or acquired, it is easily recognized by the unusual size of the veins of the prepuce. As a rule the veins cause no special discomfort, but, if large, may require removal by circumcision, ligation or electrolysis.

Herpes Progenitalis.—This is a local disease occasioned by excessive venery, a depraved condition of the system, a tight prepuce, improper genital toilet, contact with an irritating discharge, some neurotic condition, worry, rheumatism, gout, etc.

Clinical History.—This disease tends to recur on the slightest provocation. When herpetic lesions appear on the integument of the penis or scrotum they differ in no way from similar conditions on other parts of the body, but on the mucous membrane of the penis their course is somewhat different. Here they are recognized by the development of a single vesicle or a group of vesicles on reddened and inflamed bases, accompanied by slight burning and itching. On the mucous membrane they become softened by prolonged maceration, break down and leave superficial ulcerated surfaces, which correspond in size and form to the original vesicles. The ulcerations may fuse together; they are surrounded by a well-marked red areola, which shades off into the surrounding tissue. When irritated an inflammatory induration may occur, and it may be impossible to differentiate them from chancroids. Intense burning, neuralgic pains, which may be local or extend into the surrounding parts, may precede and accompany the attack. The disease, with some associated balanitis or posthitis, lasts from four to fourteen days, and, if not properly

treated, may excite a phimosis, or the abrasions may proliferate into vegetations. When the lesion develops in the urethra, a urethral discharge is invariably present. The associated inguinal glands are often inflamed and may occasionally suppurate.

Diagnosis.—This is not difficult if the lesion is seen before the vesicles rupture, and when there is a history of sudden development after any of the exciting causes mentioned. If the vesicles have ruptured, one or more circular, moist, red, superficial ulcerated surfaces will be noticed, which are not indurated unless located in the meatus. They exude a moisture on pressure. Chancroids, chancre and mucous patches must be differentiated. It is always better when doubt exists to wait a few days to see if induration appears, especially if the early history is not clear.

Treatment.—Cleanliness is essential. After each urination the parts should be bathed with a weak antiseptic solution, dried without rubbing and then dusted with a powder composed of equal parts of pulverized Starch and Zinc oxide. The vesicles and abrasions can be painted with a 10 per cent. solution of Nitrate of silver and dusted with Subnitrate of bismuth and Zinc oleate, equal parts; Calomel, Aristol, Mercurius solubilis Hahnemanni *ix*, etc. The neuralgic pains are often relieved by the application of Carbolic acid, 1-60, a spray of a 4 per cent. solution of Cocaine; or the galvanic current to the diseased parts. In the recurrent form, when the disease is due to a long, tight or redundant foreskin, circumcision is often the only means of permanent relief.

Preventive treatment: Cold douches to the lumbar region for thirty seconds, twice a week; extra local cleanliness, with the daily applications to the parts of hot Alum water or Lloyd's Hydrastis, one part to five of warm water, followed by dusting with Stearate of zinc and Acetanilid or

Calendulated talcum. The local application of Alcohol containing 1 per cent. of Menthol, or a 25 per cent. aqueous solution of Carbolic acid, on the first indication of the appearance of the vesicles, is frequently abortive.

The remedies most often curative are :

Arsenicum album.—Vesicular eruption with burning pain and itching; itching of the glans which is blue, red and cracked.

Causticum.—Herpetic redness with oozing on the glans and frenum; vesicles on the prepuce becoming suppurating ulcers, accompanied by burning, biting, itching pains in the parts and an increased secretion of smegma.

Croton tiglium.—Vesicles on the glans and prepuce, with irritation and corrosive itching of the parts and some secretion; redness of the glans; moist spots.

Graphites.—Vesicles on the prepuce, with voluptuous itching; moist eruption; glans covered with thick mucus; tension of the parts, aggravated by contact with the clothing when walking, with pinching, drawing, jerking pains; prepuce swollen like a large water blister.

Hepar sulphur.—Herpes of the prepuce; very sensitive to touch; itching, stitching pains in the glans penis; ulcers on the prepuce with foetid discharge, associated with an inguinal adenitis.

Mezereum.—Often curative in herpes progenitalis of the aged; rebellious cases, with burning, tearing pains; excoriation behind the glans penis and profuse discharge.

Rhus toxicodendron.—Often all-sufficient in the young and middle-aged; vesicles on the glans and prepuce with intense itching soreness and smarting redness and swelling of the tip of the glans and prepuce; parts look and feel as though they had been scalded; vesicles exuding a transparent fluid.

Sarsaparilla.—Herpes on the prepuce; glans red and inflamed; pimples on the parts which burn and itch, becom-

ing moist after scratching; secretions have an intolerable odor.

Phimosis ($\Phi\mu\iota\sigma\iota\varsigma$, I bind).—This ancient term implies a narrowing of the preputial opening, preventing complete exposure of the glans. The preputial orifice may be so contracted that a probe can be introduced with difficulty, or it may even be closed (atresia preputialis).

Etiology.—Phimosis may be congenital or acquired, acute or chronic. Boys are usually born with a phimotic and elongated prepuce, but if the foreskin can be retracted so as to expose the glans, unless retained smegma or adhesions of the balano-preputial surfaces excite unlooked-for symptoms, there need be no anxiety. The preputial orifice enlarges rapidly as the child advances toward puberty, allowing the glans at this time to be readily exposed. Sometimes the prepuce is congenitally absent.

Clinical History.—When the preputial opening is not as large as the urethra, indicated by the ballooning of the prepuce at each urination, an immediate circumcision is indicated. If neglected, the mechanical irritation from over-distension of the preputial sac during micturition with the urine, some of which remains after the act, will in time set up a balano-posthitis and cause vegetations to appear, adhesions of the preputial sac, formation of preputial calculi or the incrustation of the glans penis. If the preputial opening becomes red and inflamed, inciting the child to pull on the parts or retain the urine for a long time simply because it hurts him to urinate, circumcision or the stretching of the prepuce will be necessary. This treatment also applies where the prepuce is redundant and the meatus becomes red and puffy, the lips everted and irritated, exerting such reflex conditions as spinal disorders, spastic palsies, pseudo hip joint disease, convulsions and muscular incoördination, enuresis, etc., or where warty growths, fissures, retention of

smegma result or the prepuce becomes adherent. In adults, a tight prepuce may require surgical attention to prevent the serious results of herpes, retained smegma, or as a prophylactic in preventing possible future diseases, etc. Phimosis is generally congenital, though it may be acquired from cicatricial contraction, following chancre, herpes, or indirectly from inflammation of the integument, the resulting new-formed connective tissue forming an inelastic but contracting band about the glans penis, which tightly presses upon and grasps it, as it were, when any attempt to retract the foreskin is made.

Treatment.—In childhood, circumcision is frequently necessary, but stripping the prepuce back and dilating it under proper antiseptic precautions may suffice. The preputial opening should stretch sufficiently to allow the foreskin to be easily retracted behind the glans.

Stripping the glans should be executed under proper aseptic conditions. The penis is grasped between the thumb and forefinger of the left hand and the prepuce pushed back by those of the right. If the preputial orifice is narrow, the point of a pair of small dressing forceps may be introduced and opened carefully, but only to a moderate degree, and the stripping repeated until successfully accomplished. Adhesions between the glans and the inner surface of the prepuce must be carefully broken up with a flat probe. The stripping must be continued until the sulcus back of the glans is completely exposed and the accumulated smegma removed. The exposed parts should be cleansed with an antiseptic solution and dressed with Boric acid or Calendula salve and the foreskin immediately returned over the glans; otherwise rapid swelling and paraphimosis may result. The dressing must be repeated daily until the balano-preputial membranes are entirely healed. In this operation the foreskin is left in its natural condition to protect the numerous nerve filaments having their terminal fibres on the glans penis. Excepting in phimotic conditions

in the adult, and in those resulting from contracting tissue and thickened new growths, or from venereal requirements, the stripping operation is very satisfactory.

Circumcision.—This operation was introduced as a religious rite by Abraham in the year of the world 2059, and has been continued by the Hebrews since that date. Several of the Eastern nations also practice it for hygienic reasons. The operation consists in removing the anterior portion of the mucous and cutaneous layers of the prepuce and the preputial opening, with the formation of a much larger new one. When a patient over twenty days old is to be operated, general anæsthesia is usually advisable; previous to this time the infant has but little power over the thighs and consequently no anæsthetic will be required. Chloroform is generally used up to the eighth year, after which Ether is preferable unless for some special reason it is contra-indicated. Locally, Cocaine, under strict aseptic conditions may be employed. Perfect asepsis and antisepsis in all the steps of the operation must be observed. One of the older methods of circumcision for children is as follows: A probe is passed into the preputial opening and swept around the sac to break up adhesions, or the foreskin may be forcibly retracted. The prepuce is then caught at the muco-cutaneous junction above and below with artery clips and drawn forward as far as possible. The circumcision forceps are then applied and fastened on the foreskin at an angle of sixty degrees to the long axis of the penis, the lower end of the forceps being just below the inferior tension clip and in front of the glans, care being taken not to include any portion of the glans. The redundant tissues are then removed with curved, flat scissors. On removing the circumcision clamps the divided skin rolls back, exposing the mucous membrane covering the extended end of the corpus spongiosum. After the external or skin layer is removed the mucous membrane is slit down the dorsum to the coronary

sulcus and both free sides trimmed to its edge, the frenum being avoided. Hot water or torsion will usually control the hæmorrhage. When it does not, the bleeding points can be enclosed in the coarse horsehair sutures used to approximate the mucous and cutaneous surfaces. In very young children sutures, except one at the frenum, are not necessary as the parts heal in about forty-eight hours. In adults, a large number will sometimes be required. The tied ends of the sutures should not be cut too short, about an inch being allowed to remain to prevent irritation which may result from the short, sharp ends sticking into the tissues, frequently causing swelling and possibly œdema during the first few days.

In adults the first two sutures, one on either side of the frenum, should approximate the raphé of the integument of the penis and the frenum and also include the frenal arteries, the third should be located at the dorsal median line, and all tied tightly, cutting into the skin. The remainder, as many as are necessary, should be placed between these and tied loosely. Horsehair sutures usually cut themselves out and come away with the scab by the fifth day. If they remain they can be removed on the fifth to the seventh days.

When removing the foreskin of young children, Dr. John L. Moffat's circumcision shield is very useful in the after-treatment, as it not only protects the parts, but prevents displacement of the dressings. Sometimes marked œdema follows the operation and requires the application of an ice bag.

For adults and large children the following method of circumcision has been satisfactory: The mons veneris and adjacent parts are shaved and cleansed thoroughly with green soap and hot water, followed by copious irrigation with Bichloride of mercury, 1-3000, special attention being paid to the preputial sac and the immediate field of operation and the urethra douched with a warm saturated solution of Boric acid. The penis is passed through a small opening in the

centre of a dry sterile towel, or dry sterile towels are laid about the penis, the abdomen and thighs being also covered.

When the operation is to be performed under local anæsthesia, a sterile No. 15 French elastic rubber catheter is tied around the root of the penis to inhibit the return circulation. By means of a sterilized hypodermic syringe, twenty to thirty drops of a sterilized 4 per cent. Cocaine solution are injected into the subcutaneous connective tissue in front of



FIG. 1.—Circumcision.

the encircling catheter, and by extending the injection in a line completely around the penis, a bleb-like ring is formed. This method of infiltration prevents the deformities which occasionally occur when the Cocaine is injected in the vicinity of the line of the proposed incision.

When anæsthesia of the distal portion of the penis is complete (usually in five minutes), or general anæsthesia has been employed, the point of union of the integument and mucous

- membrane at the junction of the frenum and raphé of the penis is firmly seized in a pair of artery clips, the corresponding dorsal point being fixed in a similar manner. An assistant raises the two clips upward and separates them slightly, thus putting the foreskin on the stretch. The glans being pushed back by pressing upon the foreskin with the forefinger and thumb of the left hand, the prepuce is transfixed in the



FIG. 2.—Circumcision.

centre with a straight, double-edged bistoury (Fig. 1), the blade being introduced parallel to the broad surface of the glans and at right angles to the long axis of the penis. The incision is carried obliquely forward and downward, care being taken to avoid injury to the glans and to leave sufficient length to the frenum. With a pair of curved scissors the remainder of the preputial skin is removed (Fig. 2) by cutting

upward and backward on a line parallel with the corona glandis. The mucous membrane is cut away, parallel to the corona glandis, a quarter to a third of an inch only being allowed to remain, and finally the submucous and subcutaneous tissues are trimmed to prevent subsequent induration and thickening along the line of union, which is liable to occur and often requires months for absorption, or possibly gives rise to later reflex symptoms.

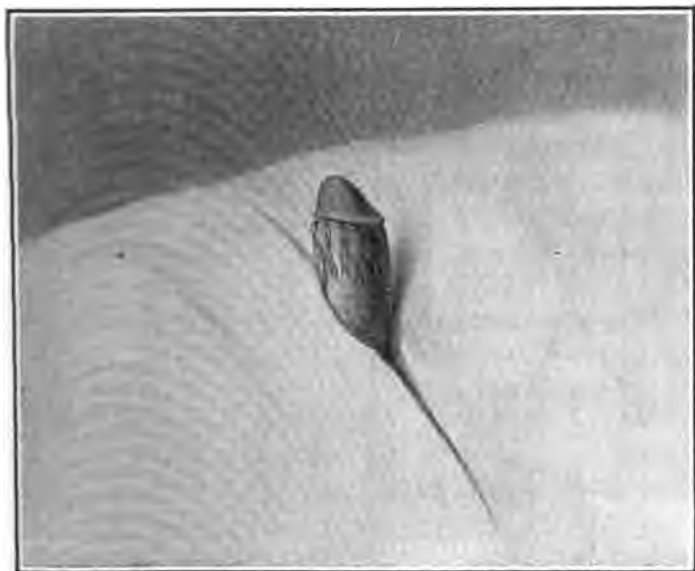


FIG. 3.—Circumcision.

If local anæsthesia from Cocaine has been employed, the catheter encircling the penis is released but not entirely removed, as it may be necessary to again employ it in regulating the entrance of the Cocaine into the general circulation. Bleeding points being properly secured, either by catgut ligatures, torsion or hot water, the divided parts should be carefully approximated by interrupted No. 4 black silk, sutures (Fig. 3)

which should be removed on the seventh day. The parts are treated by the dry or wet aseptic method. A ring of sterile gauze, two inches thick, with an opening four inches in diameter, is placed over the penis like a jack-in-the-pulpit, held in position by an upper and two lateral strips of surgeon's adhesive plaster, the space between the ring and the penis loosely packed with sterile gauze (Fig. 4), and all held in place by a T-bandage. The line of union should be bathed twice daily with a



FIG. 4.—Circumcision Dressing.

warm 50 per cent. aqueous solution of Electrozone or Bichloride of mercury, 1-5000, and, after drying with absorbent cotton, dusted with Aristol. The dressings should be changed when soiled, and after urinating the last drop of urine should always be removed with absorbent cotton. Rest in bed, while not essential, is very beneficial, especially during the first three days. Union by first intention may be expected in about eight days.

Occasionally in phimotic conditions it is advisable, in place

of circumcision, to reconstruct the prepuce by increasing its width and diminishing its length, thus preserving its function and leaving a covering for the sensitive glans. A dorsal cut is made in the central line of the prepuce extending from the coronary sulcus forward to within one-third of an inch of the preputial border by transfixing the prepuce from within outward with a sharp-pointed bistoury, the margin of the prepuce being held firmly with a pair of artery clips while the incision is made from behind forward with a pair of sharp-pointed scissors. The inferior incision is carried from the preputial margin directly backward along the line of the raphé, about one-third of an inch, sufficiently to extend slightly beyond the end of the dorsal incision. These two incisions sever all the constricting bands of the prepuce and allow of complete exposure of the glans. The skin and mucous membrane of the lower incision are united with a continuous catgut suture. The foreskin is drawn back and the longitudinal incision becomes transverse, and its skin borders are united with sutures. The incision in the mucous membrane requires no treatment. The prepuce is surgically dressed and bandaged back of the glans, which, with the meatus, is left exposed. The dressings should not be removed for four days. The sutures should be removed on the sixth or seventh day, the parts dusted with antiseptic powder and lightly bandaged with Borated gauze. If the glans is especially sensitive, it must be protected for a few weeks by a piece of Boric acid gauze held in place by a loose elastic band.

The relief of a phimotic condition of the prepuce by a dorsal incision is sometimes advisable, as in the diabetic or in elderly men when simplicity of operation is of prime importance. The incision is made under local Cocaine anæsthesia, and the mucous and cutaneous surfaces approximated with four to six black silk sutures; in the infant, if the cut is carried well down behind the corona, the prepuce not develop-

ing with the general body, it will, in time, give a result quite as good as that from complete circumcision.

If the patient is very nervous or just recovering from an alcoholic debauch, Cocaine should be used with extreme caution and only allowed to pass very slowly into the general circulation. If Cocaine symptoms appear, the catheter surrounding the penis should be reapplied for a few moments; if they become pronounced, drop doses of the tincture of Aconite should be given every fifteen minutes until they subside, with possibly a hypodermatic injection of one one-hundredth of a grain of Nitroglycerine. If an ounce of whiskey or two or three drops of Volasem are administered at the beginning of the operation, the Cocaine will rarely produce systemic effects. The proper sterilization of the Cocaine solution does not impair its anæsthetic value and local destruction of tissue does not follow the hypodermatic use of the sterilized solution provided thorough asepsis is observed.

Inflammatory Phimosis.—This condition is generally transitory, the prepuce being swollen, red and tumefied, producing marked narrowing of the preputial opening. It is always secondary to some other disease, such as balanitis, herpes, chancroid, chancre, etc.

Treatment.—This swelling is often rapidly reduced by the application of hot fomentations made slightly aseptic, hot baths, with injections into the preputial cavity, by means of a flat-nozzled syringe, of some cooling or antiseptic solution, such as dilute lead water; rest in bed, and carrying the penis well up against the hypogastrium until the inflammation subsides. If the inflammation continues and a chancroidal cause is suspected or the circulation is interfered with, lateral incision of the walls of the preputial sac, for treatment or diagnostic purposes, may be required. Incision can be performed under either Ether or Cocaine anæsthesia. The technique of this procedure is as follows: The penis having been

made aseptic and the preputial sac irrigated with Thiersch's solution or one of Bichloride of mercury, 1-3000, the flat blade of a Taylor's phimosis scissors (Fig. 5) is introduced through the preputial opening and along the side of the inner wall of the preputial sac until its end rests in the coronary sulcus and the blunt blade is located in the median lateral line. The scissors are

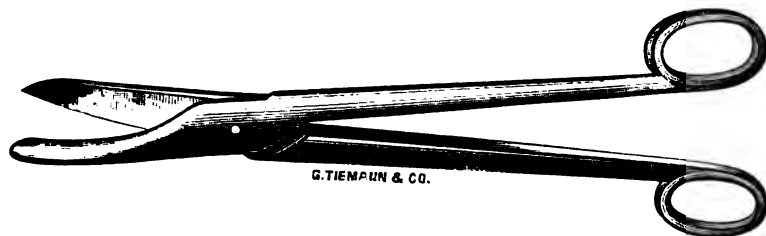


FIG. 5.—Taylor's Scissors for Phimosis.

then closed, care being observed that the thickened foreskin does not slide from between the blades and necessitate a second incision to complete the division. The operation is repeated on the opposite side of the foreskin, dividing it into an upper and lower flap, which, when turned back, reveals the entire glans, corona and frenal fossa (Fig. 6). Bleeding is



FIG. 6.—Lateral Incision of the Prepuce Exposing Glans, Frenal Fossa and a Chancroid.

often free, but ligation of the vessels is rarely necessary. After irrigation with a hot antiseptic solution, a few layers of Iodoform gauze should be placed between the flaps and the glans and held in place with a moderately tight bandage. This dressing must be removed within twelve hours, the parts

irrigated, dusted with Iodoform and each flap separately dressed. The dressings should be reapplied daily or whenever they become wet while urinating. The wound heals rapidly, but an upper and a lower hard œdematous mass will remain, which will require a plastic circumcision to give the parts a presentable appearance. Infection of the wound rarely occurs.

Paraphimosis (*παρα* outside; *Φιμων*, I bind).—This applies to that condition where a tight prepuce has slipped back of the corona glandis and cannot be replaced. Paraphimosis, if not relieved, by interfering with the circulation of the parts, may in a short time lead to the most serious results.

Etiology.—It is usually caused by the inflammation accompanying herpes, chancre, gonorrhœa, balanoposthitis, etc., or improper manipulation of the parts of one having an unnaturally narrow preputial opening.

Clinical History.—If the constriction is of any magnitude the natural folds of the prepuce become rapidly œdematous; and the glans penis congested, cold, devoid of sensibility, purple or even gangrenous; behind the corona will rise a tense, œdematous, shining collar, back of which is a deep sulcus, most marked above and possibly ulcerated. In this sulcus lies the stricture or preputial margin. Back of the sulcus is another band of œdematous tissue. If this constriction is not relieved by surgical measures, retention or extravasation of urine, with gangrene of the penis, may result.

Treatment.—When the paraphimotic œdema is excessive, small punctures made in the œdematous collar will permit oozing of the exudate, cause a reduction of its size and facilitate replacement of the parts. If the paraphimosis is of recent origin, the parts may be anointed with some antiseptic oil, the penis grasped behind the swelling between the first and second fingers of each hand on their respective sides and the thumbs placed on the glans (Fig. 7); then, while the thumbs press

the glans back, the fingers draw the œdematous parts forward and the paraphimosis may be reduced. General anæsthesia relaxes the parts and facilitates the replacing of the prepuce. If this treatment is not successful, the glans may be wrapped in an elastic band for some hours and so compressed that it may be slipped through the constricted collar by the aid of the handle of an instrument. Should all manipulations fail, the constricting band must be incised, it being always remembered that it is the second band that is to be cut. This is easily and painlessly done under local Cocaine anæsthesia, the incision being carried in the median line down through the tissues until all the stricture bands are divided. The length of

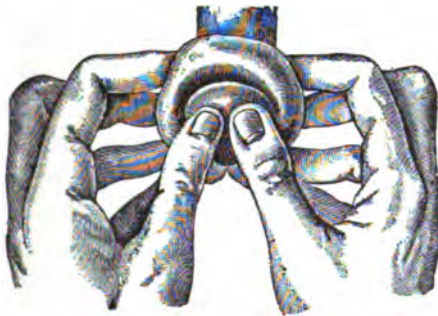


FIG. 7.—Reduction of Paraphimosis.

the incision should be double the estimated length of the prepuce, the centre of which corresponds to the location of the constricted preputial opening. When the band is completely divided the wound will assume a diamond shape. After being douched thoroughly it should be dusted with Aristol and surgically dressed. Recovery is generally rapid and satisfactory.

The variety of surgical relief necessary will depend somewhat upon the conditions present. If the paraphimosis is accompanied by complete or nearly complete strangulation, and manipulation does not succeed at once in replacing the prepuce, the constricting band must be immediately severed.

When the paraphimosis is the result of a specific ulceration, the local ulceration generally will not heal until the strictured band is divided and the circulation relieved. Infection of the new wound does not follow. In elderly persons, when an acute paraphimosis exists, the parts should be elevated and painted with a 4 per cent. solution of Tannin until the inflammatory condition subsides. Inflammatory paraphimosis is generally best treated by elevation of the penis and application of astringent evaporating stupes.

The Frenum.—This anatomical part varies greatly in degree of development. It is usually of sufficient length, but sometimes it is so greatly shortened that it may impede coitus, not only by producing a downward curvature of the penis when erected, but by causing much pain during erection. A transverse incision or its entire removal may be necessary to give relief. Sometimes, as in hypospadias or as the result of some ulcerative disease, it is absent.

TUMORS OF THE PENIS.

Papillomata.—**Etiology.**—Venereal warts are vascular papillary outgrowths, due usually to uncleanness and moisture, occurring particularly in persons having long, tight or adherent prepuces. They frequently complicate balanoposthitis, herpes and venereal lesions. A special idiosyncrasy seems to exist in some individuals. They have not been proven to be contagious.

Clinical History.—Papillomata are generally located behind the glans penis, but they may appear on any part of the external genitals or within the urethra. Occasionally they attain a large size and may interfere with coitus. On the mucous surface they are moist, red, purple, pink or dirty gray, and often bathed in a fetid, purulent discharge. They become readily inflamed and may bleed profusely from slight traumatism. On the integument of the genitalia they are dry, hard

and of a red or dirty brown color. They may be broad and flat, long, narrow, arrow-shaped, arranged like a cock's comb, or be pedunculated, single or multiple, the form assumed depending largely upon the pressure exerted by the surrounding parts. If irritated they may become malignant.

Diagnosis.—Simple papillomata are soft to the touch; specific condylomata are thick, infiltrated, feel firm and rigid, and there is usually evidence of leucitic disease elsewhere. In villous cancer there is associated pain; microscopic examination will show the special nature of the growth. Before the forty-fifth year vegetations are usually benign; after that age they sometimes assume a malignant character.

Treatment.—Immediate and entire removal should be advocated. Cleanliness alone may suffice, immersion in a hot antiseptic solution for some hours, followed by the application of equal parts of Calomel and Salicylic acid being especially efficacious.

When the warts are isolated or pedunculated, a paste of Resorcin, made with water, applied daily, and protected with gauze, acts well. When multiple or extensive they should be bathed with Alcohol or Ether, dried, and painted with a solution composed of Resorcin, twenty parts, and Collodion, eighty parts. With the destruction of the growth a granulating, worm-eaten surface presents, which soon cicatrizes under the application of a slightly astringent powder. Papillomata often disappear under the daily painting with a saturated solution of Salicylic acid and Collodion or a mixture of Bichloride of mercury, thirty grains to the ounce of Collodion, the parts in the meantime being kept dry by dusting with Subnitrate of bismuth, Tannin, Aristol or Dermatol. The daily application of the chalk-like deposit resulting from a 10 per cent. mixture of Salicylic acid in Acetic acid causes the growth to shrivel and, in a day or two, fall off. If the papillomata are broad, flat and numerous, especially if of

venereal origin and located on the scrotum, the daily antiseptic bathing of the parts, followed by the application of Calomel, soon causes them to disappear.

When local methods of removal fail, the pedunculated variety should be ligated with a silk ligature or removed with curved scissors and the base cauterized with Nitric or Carbolic acid. The broad growths may be painted with a 5 to 10 per cent. solution of Cocaine and shaved off with a sharp bistoury even with the surrounding tissues, re-anæsthetized, and cauterized with Pyrozone, 25 per cent., or Nitric or Carbolic acid, the surrounding tissues being protected by Vaseline. Cauterization may be repeated every third day until the growth is destroyed. After the vegetations turn white, the surplus acid must be absorbed with cotton or blotting paper. If pain continues after the application of Nitric acid, a drop of Carbolic acid will relieve it. The area cauterized should be dressed with Zinc or Boric acid ointment, or dusted with Iodoform, Aristol, Calomel or Zinc oxide. Sometimes the actual cautery may be required. The papillomatous growth with its base may be entirely excised, the healthy edges united by catgut sutures and the parts dressed with usual surgical care. If large vessels are severed their ligation will be necessary.

When local treatment fails to eradicate or prevent the recurrence of the papillomata, circumcision may be required, with curettement of the growths on the glans, followed by cauterization, etc.

The remedies symptomatically indicated must always be administered.

Calcareæ carbonica.—As a constitutional remedy *Calcareæ* is often required to prevent the return of these growths.

Cinnabaris.—Warts on the prepuce bleeding from the slightest touch, followed by itching and swelling, accompanied by the exudation of pus of a nauseating, sweetish odor.

Nitric acid.—Is useful not only locally but internally for excrescences on the glans and prepuce, which look like raw flesh, exude an offensive moisture, bleed easily, and are accompanied by much itching, pricking and sticking in the parts.

Natrum muriaticum.—Locally as a normal salt solution and internally in the potencies often acts satisfactorily.

Sepia.—Large, hard, painless warts.

Sulphur.—Throbbing, painful warts.

Staphisagria.—Soft excrescences around the glans, covered with an offensive discharge; moisture around the corona; itching of the parts from the pressure of the shirt; sticking pains in the glans when standing.

Thuja occidentalis.—Is particularly indicated in all papillary growths. When papillomata are removed by surgical methods, this remedy, to prevent recurrence, should be given for some months.

Horny Growths.—These lesions are extremely uncommon. The growth generally begins as a warty proliferation on the integument. It may grow to a considerable size (Fig. 8), forming flat plates or round, striated projections of a yellowish-brown color. They often have a tendency to crack and ulcerate about the base. If untreated the growth often undergoes epitheliomatous changes. It should be excised and the wound closed by sutures. Horny growths upon the glans penis should be removed, the base curetted and cauterized to prevent their recurrence.

Scleroderma of the Meatus.—Cause is unknown. The mucous membrane of the meatus and the urethra as far as the fossa navicularis, with much of the submucous tissue, is transformed into sclerotic or cartilaginous tissue which presents a glistening white surface with a distinct and hard outline. As the lesion develops the meatus contracts, producing difficult and often painful urination. In the author's case, a boy twelve

years of age presented a meatus so contracted that a small probe could be introduced with difficulty. Sometimes the parts become cracked and fissured. The disease may involve the prepuce.

Treatment.—Meatotomy.

Sebaceous Tumors of the Prepuce sometimes occur. They appear soon after birth, are putty-like in consistency, grow slowly and may become the size of an olive. They should be removed by enucleation under local Cocaine anæsthesia.

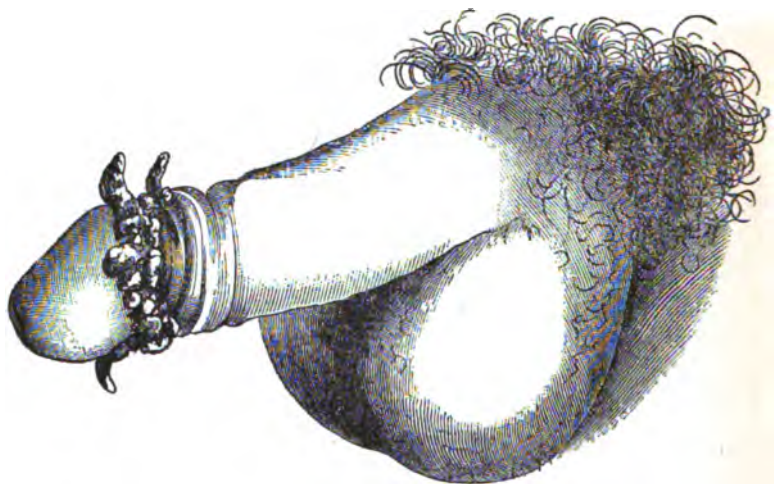


FIG. 8.—Horns of the Penis. (Demarquay.)

Nævi, Fibrous, Cystic and Enchondromatous Growths of the Penis sometimes occur. If they can be removed without injury to the erectile tissue, surgical relief is indicated.

Elephantiasis of the Penis.—When affecting the prepuce and skin as a primary condition, it is extremely uncommon, though it often follows a scrotal invasion. The organ becomes much increased in size and presents a convoluted appearance, due to the numerous deep parallel transverse sulci surrounding it. The disease may come on insidiously, or it

may apparently be due to repeated erysipelatous attacks with high fever, etc.

Tuberculosis of the Penis.—This condition may happen without known cause. It may result from inoculation of a circumcision wound or infection during coitus. More often it is the accompaniment of a tubercular urethritis. It generally appears as a circular irregular ulcer on the glans penis surrounding the meatus urinarius or on the prepuce. The base of the ulcer may extend far into the underlying parts; it has a cheesy appearance. Unless properly treated it may destroy the glans and the body of the penis, and, while generally only slowly progressive, it may cause great and rapid destruction of tissue. At first the associated inguinal glands are not involved; later they undergo cheesy degeneration.

Treatment.—Aseptic attention, Iodoform locally and Tuberculinum or *Silicea marina* internally, diet, hygiene, with residence in a well-selected climate, may be recommended. If the lesion is primary, amputation of the penis may be necessary.

Fibroid Sclerosis of the Penis.—This malady fortunately is not common; it creates impotence in proportion to its degree of development. The disease has been described by the older genito-urinary surgeons as a chronic circumscribed inflammation of the corpora cavernosa. Its etiology is unknown. It has been thought to be of a gouty nature, a concomitant of diabetes, etc. It frequently appears in the strong and vigorous, and has developed as the apparent consequence of injury to the penis. Men of about forty or over are the usual victims, although those younger in years are sometimes attacked. Its pathology resembles that of keloid, presenting a fibrous network of scar-like tissue in which are imbedded a few blood vessels with islets of embryonic cells and evidence of fibrous transformation resembling cicatricial tissue. It never ulcerates or develops into a malignant growth.

The sclerosed area is usually situated on the dorsal side of

the corpora cavernosa and consists of thin plates of firm, **hard**, fibrous tissue, one or two lines in thickness, with **sharply-defined** margins, placed like a saddle; these saddle-like plates generally are firmly connected in the median line. **The** growth often extends downward into the trabiculæ of the corpora. There may be two or more of these saddles **along** the dorsum of the penis, one above the other. The plates may be connected in the median line by a soft elastic layer, or situated laterally; they are occasionally located in the corpus spongiosum. Fibroid sclerosis develops very slowly, extending antero-posteriorly more rapidly than laterally; sometimes the growth remains stationary for a considerable period. When the penis is relaxed the sclerotic plate is usually painless, though it may be somewhat sensitive when subjected to pressure or the organ becomes erect. The lesion generally appears as a small ovoid disk, the first objective symptom being a tendency of the penis to curve upward or sideways during erection, any attempt to straighten the erected organ producing pain. Often the symptom of pain precedes for a long time any physical evidence of the local sclerosis. As the new tissue develops, the erections are proportionately curtailed. Sometimes the penis in erection is turned or twisted almost to a right angle. When the trabeculæ of the corpora cavernosa become involved, that portion of the penis beyond the diseased part will not become congested and distended when erection is desired, but will remain soft and flexible, partially, if not completely, preventing intromission.

Usually, under any and all forms of treatment, the disease grows gradually worse, though under the symptomatically indicated remedy the growth may cease to increase. Lappa alba has been administered with very gratifying results.

Osseous Growths of the Penis are rare. They appear only in advanced life. They consist of a very gradual pathological deposit of bone in the corpora cavernosa and septum pectini-

forme. As the deposit increases, pain on erection and during coitus will be experienced. Later, with the increased amount of bony deposit, the organ becomes sensitive, painful and distorted.

Treatment.—The calcareous masses may be removed by appropriate surgical measures and function restored.

Syphilis of the Penis.—Frequently in the tertiary and less often in the secondary period, the penis is invaded by a localized infiltration or gummatous deposit; it may involve the prepuce or urethra and sometimes the posterior third of the corpora cavernosa, where it may resemble fibroid sclerosis of the penis, though it is less cartilaginous in character.

Treatment.—See chapter on syphilis.

MALIGNANT GROWTHS OF THE PENIS.

The penis is the seventh location of selection of malignant growths. It is the primary site of about 6 per cent. of all cancers occurring in men. These growths happen frequently between the ages of fifty and sixty, and often between forty and fifty. The etiology is obscure. Some observers believe intercourse with a woman suffering from cancer to be one of the exciting causes. Local irritation, accumulation of smegma in the coronary sulcus, a long, tight, adherent or redundant foreskin, etc., have apparently awakened this disease. Cancer of the penis may follow injury, and it has developed from scar tissue, but, commonly, it originates from a seemingly innocent vegetation or from a neglected chronic balanoposthitis. These growths usually commence on the prepuce or glans and generally produce deformity.

Medullary cancer develops about the age of puberty, traumatism of some form being the exciting cause. They grow rapidly, soon become painful and lobulated and give, on palpation, the sensation of a cyst. The inguinal glands are early involved.

Epithelioma seldom occurs before the fortieth year, **but** is of frequent occurrence between the fiftieth and sixtieth **years**. Neglect of proper genital hygiene, as well as a long foreskin,



FIG. 9.—Epithelioma of the Penis.

predispose to this condition. It is said that the Hebrews are exempt from penile epithelioma. Epithelioma of the penis generally commences on the glans or prepuce, beginning as a small, flat, warty growth (Fig 9), which, if cauterized or re-

moved, recurs persistently and soon becomes indurated or exhibits an ulcerated surface with an indurated base. It may also develop in a superficial inflammatory form. Burning and lancinating pains are present. Hæmorrhages from slight irritation of the growth are often very troublesome. When the growth develops slowly, the associated inguinal glands become nodular, and feel like shot. Cachexia may be absent and for some time the general health remain good, but when the disease progresses rapidly the glands promptly become involved and cachexia, loss of strength, flesh, etc., are early manifested. Ulceration advances rapidly (Fig. 10), and the surrounding tissues for a considerable area are soon involved and destroyed, the skin becoming purple, œdematous, infiltrated and nodular. It is not uncommon for the ulceration to extend and involve the penis, scrotum, thighs, perineum, abdomen, anus, etc. When ulceration sets in the diagnosis can easily be made. The destruction of tissue advances rapidly, producing a deep irregular, livid and unhealthy excavation with hard edges. The ulcer may be filled with exuberant warty growths, exuding a profuse sanious fetid discharge. The firm sheaths of the corpora cavernosa and corpus spongiosum often for a long time resist the onward course of the destructive process. Urination may remain unimpaired; should, however, obstruction of the urethra in any way occur, the urine will find an exit through some fistulous opening. When in doubt, the diagnosis must be verified by a microscopical examination of the growth.

If the nature of the disease is recognized early, that is, before the involvement of the inguinal glands, surgical removal is generally followed by excellent results. Küttner has reported a cure of 40.5 per cent. in fifty-eight cases, three to twenty-nine years after operation.

Treatment.—To prevent the fearful ravages which are sure to follow if not operated, the cancerous mass and the as-

sociated inguinal glands should be excised as soon as a **microscopical examination** confirms the diagnosis of **malignancy**. In fact, extirpation of the penis is usually the **treatment of choice**. When operated sufficiently early, great relief and some years of comfort may be given, though a **squatting position** will be necessary when urinating. When seen late, a **supra-pubic cystotomy** for drainage, with general **palliative**



FIG. 10.—Epithelioma of the Penis. (White and Martin.)

treatment, will be advisable. Marked relief has followed the administration of Arsenicum, Conium, Thuja, etc.

Sarcomata are usually secondary, though they may be primary in origin. They commence generally in the corpora cavernosa. They may develop at any period of life, but are most common during early manhood. When discovered, the growth usually appears as a small distinct lump, which increases rap-

idly in size, occludes the corpora cavernosa, interferes with the exit of the urine, excites priapism, and is accompanied by the involvement of the associated inguinal glands. The prognosis is very unfavorable. Early amputation of the penis is indicated even if the growth is liable to recur.

Amputation of the Penis.—Malignant growths, etc., often necessitate the removal of the penis. It is performed as follows: The parts being properly prepared for operation, to facilitate the later securing of the vessels, the integument is brought slightly forward on the body of the penis and one or two straight acupuncture pins are passed through the corpora cavernosa at a point well back toward the peno-scrotal junction; to prevent loss of blood during the operation a narrow elastic band or soft rubber catheter is wound tightly around the penis behind the pins and secured with a clip. The skin is divided at the point selected for amputation, care being taken not to injure the corpus spongiosum. The corpus spongiosum is then dissected from the corpora cavernosa and divided on a line parallel with the divided skin, one-half to three-quarters of an inch anterior to the proposed point where the corpora cavernosa are to be severed. The rubber ligature is released and the vessels secured with catgut. It is always well to have a cautery ready for use in case of excessive hæmorrhage. After the bleeding has been controlled the sheaths of the corpora cavernosa are stitched together along the median line, which stops oozing of blood and prevents subsequent infiltration of urine, etc. The projecting three-fourths of an inch of the corpus spongiosum is divided along the floor of the urethra back to the stump, turned back and stitched to the edge of the skin of the penis. A catheter is introduced into the bladder, the parts dusted with Aristol, dressed antiseptically, the dressings being held in place by a T- or a crossed perineal bandage. Continuous bladder drainage is maintained for from four to six days. Frequent change of dressings is always necessary.

When it is possible to form flaps from healthy penile tissue, long dorsal or short ventral flaps will be preferable to the circular amputation, as they permit of more perfect apposition of the skin, and allow of more rapid healing.

Extirpation of the Penis.—This operation is often necessary when a malignant disease of the penis is not seen until a large part of the organ has been destroyed. The urethra is divided in the perineal region, brought out through a small opening and sutured to the skin just in front of the anus. The lithotomy position is essential; a full-sized sound is introduced into the urethra as far as the triangular ligament, and the scrotum divided along the entire length of its raphé down to the corpus spongiosum, which must be carefully separated from the surrounding tissues as far back as the triangular ligament. The sound being with-drawn, the urethra is cut across just in front of the bulb and carefully separated from the other tissues. An elliptical incision is made around the root of the penis and carried back on each side to the central incision below, the suspensory ligament is divided and the crura of the corpora cavernosa separated from their bony attachments with the periosteal gouge or scissors. The urethra is brought out, slit up vertically and stitched to the lower angle of the scrotal or perineal wound. Many surgeons prefer to complete the operation by emasculation, as the testicles often become swollen and remain painful for a long time afterwards, and frequently give rise to future malignant epididymo-orchitis. The edges of the wound are properly approximated and deep drainage provided. The inguinal, femoral and all other associated lymphatic glands should be thoroughly removed. The dressing consists of a heavy pad of gauze held in place by a large T-bandage. The after-treatment calls for frequent renewal of the dressings and often, for a week or two, continuous catheterization.

SECTION III.

INGUINAL ADENITIS.

The term bubo is equally applicable to all inflamed lymphatic glands without reference to their location or to the cause of the inflammation, though it has been generally associated in thought as a concomitant of some venereal affection of the genital organs. Inguinal and femoral adenitis is generally secondary to some venereal lesion of the genitalia. It may be due to a simple inflammatory lesion or abrasion of the parts, or to a traumatism in one debilitated by disease, or to some morbid change in the lower extremities. It may be the local manifestation of a general condition. It may develop primarily, and be simple, malignant, tubercular or syphilitic. The central inguinal lymphatic glands are the most frequently involved, usually upon the side which corresponds to the exciting local lesion, though, from anastomosis, both sides may be affected, or only the side opposite to that of the original sore. When the exciting disorder is situated on the leg or scrotum, a lower chain of glands is involved than when it is situated upon the penis. There being no lymphatic connections between the testicles and the inguinal glands, a pathological lesion limited to the testes cannot have an inguinal adenitis as a complication, unless the disease in the testicles extends to the scrotal tissues.

A bubo may be expected when the lymphatics tributary to an inguinal lymphatic gland have their origin in a tissue which is the seat of an infectious inflammation, as the lymphatics will absorb and convey the resulting morbid sub-

stance to the glands, the subsequent degree of adenitis depending upon the nature of this material and the ability of the gland to overcome its pernicious qualities. Furthermore, when the material is especially virulent, the affected gland may, by undergoing a local inflammation, cut itself off from the rest of the system by interposing a plastic barrier and prevent further progress of the original pathological condition.

Men are more frequently afflicted with inguinal adenitis and resulting suppuration than women, due probably to their more active life. Lesions upon the mucous membrane of the genitalia, particularly in neighborhoods where the lymphatics are abundant, as near the frenum, are more frequently complicated with bubo than similar lesions of the skin. The time of the appearance of a complicating adenitis when due to a chancroid, gonorrhœa, herpes, etc., varies greatly, depending largely upon the care given the original lesions; it may even occur after all local disease has, for several days, been seemingly cured. Other things being equal, those who are debilitated, tubercular, or suffering from malignant or leucic disease are particularly unable to resist glandular involvement.

Simple inflammatory adenitis may be due to a strain, horse-back riding or jumping, local inflammatory disease of the uterus, rectum, urethra, lower extremities, etc., herpes progenerialis, scrotal or pubic eczema, balanoposthitis, simple urethral vegetations, chancre, chancroid, and sometimes from some undiscoverable cause. From some one of these factors, one or more of the lymphatic glands in the groin may become affected, tender and somewhat enlarged, though, if the original lesion receives proper attention, they are of little importance if the individual is healthy, but in those suffering from cachexia, or when pyogenic germs are taken up by the lymphatics from the opening in the denuded mucous membrane or skin, suppuration may follow.

Clinical History.—Adenitis occurring in either the inguinal

or femoral region may vary greatly in its clinical history. Attention is usually drawn to the parts by uneasiness or pain on walking and possibly a sensation of fullness in that region. The lymphatic glands become painful and slightly swollen, each resembling somewhat an olive, its long axis corresponding to the fold of the groin. At first the diseased glands are freely movable beneath the skin. The inflammation may subside rapidly, or the pain and swelling may increase and locomotion become difficult, the glands losing their outlines as the surrounding tissue becomes involved. The local swelling is usually accompanied by a dull heavy pain, though it may at times be intermittent, sharp and lancinating, with fever, restlessness, disturbed sleep, etc. Within ten days from the commencement of the bubo, the pain and swelling may subside, the gland slowly returning to its normal condition, or the local inflammation may increase. A peri-glandular inflammation taking place, which extends to the overlying integument and chill, fever, sweat, etc., announces the onset of suppuration. The swelling soon becomes boggy, and, at one or more points at the centre or at one side of the tumefied mass, the skin becomes dusky, fluctuation can be demonstrated and by pressing into the mass the indurated walls of the abscess can be outlined. If opened at this time, from a few drops to a drachm of pus may be evacuated, but if left to itself the pus pocket will increase in size, and, finally, open at one or more points, or the pus may burrow extensively into the surrounding tissue. After the purulent material is evacuated, the cavity of the bubo usually fills up by granulation and heals rapidly, but sometimes in broken-down or strumous patients, and particularly in those addicted to the immoderate use of alcohol, the process of healing is extremely slow.

In debilitated and cachetic constitutions a sub-acute variety sometimes occurs and a number of lymphatic glands, together with the tissues surrounding them, become involved. It is

characterized by slow development, indolent enlargement and chronic suppuration. Pain and swelling are not especially marked, the skin covering the bubo being of a dusky hue, due to sluggish circulation. When fully developed, a brawny, indurated, œdematous mass occupies the inguinal region, being sometimes of sufficient size to impede the circulation in the genitals or in the lower extremities. The connective tissue surrounding and matting the glands together may break down some time in advance of degenerative changes in the glands. These abscess cavities contain a thin, ichorous fluid, which, if not surgically liberated, will open spontaneously, the pus having first burrowed in many directions and formed sinuses which are difficult to heal. This variety of adenitis is always due to miliary glandular abscess originating within the gland. Pus may develop as early as the fourth day of the disease. Generally the glands do not break and discharge until after the peri-glandular tissue is destroyed; they may undergo a hyperplasia and develop into a fungoid growth, which, if it does not fill the bubonic cavity, prevents healthy granulation.

Gonorrhœal Adenitis.—The lymphatic glands, in immediate anatomical connection with a urethra invaded by the gonococci of Neisser, always become somewhat inflamed during the active stage. They rarely suppurate unless irritating or improper treatment of the original disease has been instituted, excessive exercise indulged in or the resisting force of the body has been greatly reduced by systemic disease. Invasion of the lymphatic glands by the gonococci seldom occurs.

Chancroidal Adenitis.—The lymphatic glands in direct communication through lymph channels with a virulent ulcer known as a chancroid are always somewhat involved, the resulting adenitis often being of the simple inflammatory variety already described. It may present the qualities ascribed to the virulent bubo, which is always chancroidal in

origin, the lymphatics conveying the virulent poison direct to the gland, where suppuration invariably results. When the adenitis is bilateral, one bubo may be of the simple and the other of the virulent type.

Virulent bubo constitutes more than one-half of all suppurating forms of adenitis in the groin. The development of a virulent inflammation depends somewhat upon the power of resistance of the individual, as evidenced by his general health. All conditions which predispose to absorption—chafing from exercise, uncleanness, etc., local applications which irritate without completely destroying the chancroidal principle, salves, caustics, etc.—favor this complication. Chancroidal adenitis may be suspected when the bubo develops rapidly, though in the early stages it is impossible to distinguish it by its physical signs from a simple inflammatory adenitis. The first pus formed and discharged from a virulent bubo may have the character only of a simple suppuration; in other words, it is non-irritating and non-auto-inoculable, being derived from the periglandular tissue, which, though last involved, yet, from its loose cellular character, breaks down rapidly. Later on the discharge has all the properties of that from a true chancroid.

Taylor is of the opinion that "the virulent bubo depends for its infecting properties upon infection introduced from without;" in other words, "want of aseptic care." Virchow calls attention to the fact that "the poison is found in the substance of the involved gland and not in the surrounding tissues." Hence the virulent nature does not appear until the gland tissue breaks down and discharges. Shortly after the virulent bubo opens it assumes the characteristic appearance of a large chancroidal ulcer, with everted edges, worm-eaten, uneven base, and discharges a watery, yellow or bloody pus; if cleanliness is neglected, auto-inoculation of the adjacent parts soon occurs. Often there is much destructive burrowing into the surrounding tissues with the formation of sinuses and pockets

which may never heal. Many, however, close rapidly ; others become phagadenic and may assume the serpentine form, extending upward over the abdomen or downward over the thighs, producing much destruction of tissue and subsequent deformity. Sometimes, with the advance of the destructive ulceration, large vessels are dissected out or even opened. Again, when the disease has seemed about cured, from some latent dyscrasia, it renews its ravages and may possibly terminate, from exhaustion, in death.

Syphilitic Adenitis may occur as an early or late manifestation of leutic infection. During the secondary stage of syphilis all the lymphatic glands of the body become enlarged, those nearest the chancre indurating a little in advance of the others, usually within ten days after the appearance of the primary lesion. The lymphatics in the dorsum of the penis, which lead from the chancre to the glands, often feel like cords beneath the skin. The glandular enlargement is usually a little more pronounced in the inguinal region corresponding to the side of the penis upon which the original lesion is located. The chain of glands involved does not increase in size to any great extent, though one or two may be especially affected ; they may become as large as walnuts. They are freely movable beneath the skin, comparatively free from pain, and give rise to few subsequent symptoms. When uncomplicated they do not suppurate, though they may remain indurated for some months. If the leutic condition receives early and appropriate treatment, the induration will soon disappear, but if the systemic treatment is neglected, re-induration may occur. When the adenitis or original lesion does not receive the proper attention, is subjected to traumatism, becomes contaminated by a gonorrhœal discharge, some chancreoidal material or pyogenic germ, or the disease is engrafted upon a tubercular adenitis, suppuration may follow.

In late syphilis the inguinal glands, which have been pre-

viously diseased, sometimes undergo gummatous involvement. The gland, from the accumulation of gummatous material, gradually and painlessly increases in size, the surrounding tissues become involved, forming a hard mass, dark-red in color and adherent to the skin. As the condition advances the central part of the gummatous mass, from lack of nutrition, softens, opens, and discharges its glairy, transparent contents, leaving a deep, punched-out excavation.

Tubercular Adenitis is not of uncommon occurrence, though often its character is not recognized. It may be acute, sub-acute or chronic, and of primary or secondary origin. Acute tubercular inguinal adenitis is generally brought into activity by a chancroidal, gonorrhœal or some simple inflammatory condition of, or injury to, the genitalia. The lesion develops rapidly and simulates a virulent bubo, one or more glands being involved. The inguinal region becomes swollen, painful, tender, and the overlying skin assumes a dusky-red appearance. If not treated, softening follows and the tubercular material is discharged externally, leaving a large tubercular ulceration. The broken-down material should always be examined for tubercle bacilli to confirm the diagnosis, though a tubercular history, with the hectic fever, rapid emaciation and systemic exhaustion, strongly suggest it.

In the sub-acute variety the glands enlarge painlessly, become hard and practically present no subjective symptoms. In the chronic variety the glands slowly increase in size, soften in spots, and terminate in small, circumscribed abscesses. When irritated, or the vitality of the system is at a low ebb, they may break through the gland capsule and coalesce, producing infiltration and destruction of the surrounding tissues. They may finally become encapsulated. Previous to the breaking down of the capsule of the individual gland, the tubercular mass may be one-half to two inches in diameter, freely movable and easily outlined beneath the overlying skin,

but after infiltration of the peri-glandular tissue, its contour becomes indistinct or lost and an inflammatory mass of a dark-red color occupies the inguinal region. Unless irritated by treatment it is not particularly painful, though, if large, it may impede locomotion, press upon the femoral vessels and cause oedema of the lower extremities, or upon the nerves and give rise to neuralgic pains, etc. Under good hygienic and medicinal attention the lesion is sometimes absorbed. As a rule, however, it breaks down at various points and discharges upon the surface, a special tubercular sinus leading to each separate tubercular chamber from which there oozes a thin watery discharge. This resembles gummatous adenitis, but the infiltration is more extensive and painful. When in doubt, the presence or absence of the tubercle bacillus and the results following the use of large doses of Potassium iodide will assist in making a diagnosis.

Malignant Adenitis is generally secondary to a similar lesion of the genitalia and, as a rule, easily recognized. The lymphatic glands of the groin may, however, be the seat of a primary invasion. This condition cannot at first be positively diagnosed, but as the malignant growth advances, microscopical examination of a section or exclusion of other conditions may lead to the correct diagnosis.

Treatment.—This varies with the cause and the period of development. About one-half of all buboes, even when occurring with chancroid, are of a simple inflammatory nature and can be aborted by the proper treatment, if commenced sufficiently early. The virulent bubo, however, will run its regular course, though much may be done to lessen its severe manifestations.

Patients suffering with gonorrhœa, chancroid and other conditions liable to cause buboes, should curtail their physical exercise. Attention must be given to the proper treatment and cleanliness of all the probable sources of infection.

The discharges from all lesions liable to produce this complication must be removed as fast as they accumulate. The bowels should be evacuated daily by a saline cathartic to avoid straining at stool, which especially predisposes to irritation and local disease of the glands. Irritating ointments and injections in the treatment of the predisposing lesions are objectionable. There is much controversy as to whether the cauterization of a chancroid has a detrimental effect if thoroughly done, but there is no question as to the harm resulting from imperfect cauterization. If much glandular tenderness exists the motion of the thigh should be limited either by enforced rest or the application of a spica bandage, holding a pad of gauze firmly over the swollen and painful parts. Many treat buboes solely by pressure, employing a bag partly filled with small shot or sand, weighing about five pounds, or a sponge bandaged over the part and kept moistened to secure continuous compression.

With the onset of inflammation, cold applications with rest in bed are of the utmost importance. A rubber bag filled with ice-water is often beneficial. Hot poultices, by their moist heat, if the vitality has not been too greatly impaired, will prevent suppuration; later, they hasten and yet limit it. Injections into the substance of the inflamed gland of ten minims of a 15 per cent. solution of Carbolic acid has numerous advocates. Benzoate of mercury, one part to one hundred parts of a normal salt solution, also acts kindly in causing resolution of the inflammation. The local application, to other than tubercular buboes, of one of the following ointments will, if used sufficiently early, promote resolution, and in a large percentage, succeed in preventing formation of pus. Ichthyol, one part to three of Lanolin; Iodide of lead ointment, containing one part to twenty of Extract of belladonna; Resorcin, five parts; Ichthyol, ten parts; Mercurial ointment, thirty-five parts, and Lanolin, fifty parts, or Ungentum

hydrarg., Ungentum belladonna, Ichthyol, and Lanolin, of each two drachms. The selected ointment is spread on a piece of surgical lint of sufficient size to cover the inflamed area; over this a piece of oiled silk, a pad of absorbent cotton, and all held in place by a firm spica bandage which must be replaced every second day. Iodine, on account of the complications which are likely to follow its use, is now rarely applied locally and Collodion is not to be recommended. The measures, suggested with the hygiene and diet advisable for the causative condition, and the administration of Aconite, Belladonna, Apis, Mercurius bin-iodide, Nitric acid or Hepar sulphur, will often be successful in preventing suppuration. If, however, after a few days, resolution does not take place and the inflammation increases, the bubo, be it simple or virulent, should, before the small abscesses rupture, be enucleated, and the wound properly sutured, with the expectation of primary union and slight scar. After peri-glandular invasion, enucleation is not advisable.

When suppuration is established, the parts should be washed with soap and water, then with Ether, and finally with a solution of Bichloride of mercury, 1-1000, and the pus evacuated with the aspirator, the walls of the abscess allowed to collapse and a compress applied to promote adhesion. In general, after preparation as above, the following modification of Poutain's method is advisable: A short incision is made into the abscess with a small narrow-bladed bistoury. This is not painful if the point of entrance is first painted with a little Carbolic acid, or if five drops of a 2 per cent. solution of Cocaine are subcutaneously injected at the point of the proposed incision. The pus from the abscess should be pressed out, a probe introduced and the partitions leading to the adjoining diseased glands broken down, the wound cleansed with a 50 per cent. solution of Hydrogen peroxide, irrigated with a hot Bichloride of mercury solution, 1-1000, and immediately

filled to distension with warm Iodoform ointment (ten parts of Iodoform to ninety of Vaseline), which, however, should not be hot enough to liberate the Iodine. A cold compress should then be applied, covered with absorbent cotton and held in place by a crossed perineal bandage. The patient should remain in bed for a few days, though exercise is not incompatible with good results. A complete cure often follows in from eight to fourteen days. On the fifth day the parts should be examined. If there is no evidence of inflammation the dressings should be re-applied for a few days. If there is evidence of inflammation the bubonic cavity should be redressed as originally directed. When successful, no scar remains.

The bubo may be opened in the manner already described and a strip of Carbolic or Iodoform gauze introduced through the incision and the pus allowed to drain away slowly. If in a day or two the skin over the bubonic cavity drops in and becomes discolored and shrivelled, this should be removed with curved scissors and the wound treated as a simple ulcer or chancroid, as may be required. Incision and drainage will sometimes be necessary when the Iodoform method of treatment is unsuccessful, or when an active outdoor occupation must be continued, the suppuration is ill-defined, deep-seated, and there is much associated inflammation of a virulent type, or it is of tubercular nature. The incision must open freely all the most dependent parts and pockets of the pus cavity, with necessary counter-incisions to give perfect drainage, carefully avoiding wounding the femoral vessels, which have on more than one occasion been opened with fatal results. Dead and dying tissue should be removed with the curette and the cavity cauterized with pure Carbolic acid, or flushed with a 50 per cent. solution of Hydrogen peroxide, followed by a 50 per cent. solution of Electrozone, or one of Bichloride of mercury, 1-2000. A small drainage tube with lateral

perforations may be inserted, or the cavity packed with Iodoform gauze. The groin should be covered with gauze, held in place by a spica bandage, and the dressings changed daily. If the wound is slow in closing, it may be stimulated by the addition to the Iodoform gauze of Balsam Peru, Ichthyol or Bovinine.

Sometimes, when there is an extensive area of inflammatory induration or the opened bubo is sluggish, a poultice composed of equal parts of ground linseed meal, charcoal and hot yeast, well mixed, applied frequently and hot, will reduce the inflammatory exudation in the surrounding parts and restore the circulation to such a degree that granulation of the abscess cavity will be stimulated, and the usual surgical applications will soon cause the opening to close. Stimulation with a powder composed of equal parts of Zinc oxide and Cinchona bark is also of value. When the granulations become exuberant it may be advisable to curette and stimulate cicatrization with a solution of Nitrate of silver, twenty to sixty grains to the ounce of water. Sinuses from adenitis may heal under stimulating treatment, but, as they often reopen, they are best treated by free incision, removal of the indurated walls and approximating of the wound by sutures. When sinuses are deep-seated or when located near the great vessels they should be curetted, cauterized and kept open by sponge tents, or by suppositories of wax containing Iodoform. Injections daily into the cavity of an emulsion of Iodoform and Vaseline often give good results.

After incision and drainage, when resolution does not progress favorably, owing to a diseased gland or a portion of one remaining in the cavity wall, enucleation of the affected glands is sometimes necessary.

Enucleation of the diseased gland is the operation of choice in tubercular adenitis, when the lesion is ill-defined, or a general hypertrophy of a chain of inguinal glands

exists except in those due to a chancroidal infection. In the latter, incision and drainage should first be tried, to be followed by excision if necessary. In the operation of enucleation of the inguinal glands, a free incision is made over the diseased area, parallel to Poupart's ligament, of sufficient depth to expose the glands, which should then be shelled out with the fingers or by blunt dissection. If pus pockets in the walls are opened, they should be carefully curetted, the cavity thoroughly irrigated with a 50 per cent. solution of Peroxide of hydrogen, followed by Bichloride of mercury, 1-2000, then packed with Iodoform gauze, dressed as directed for open incision, and the cavity allowed to heal by granulation. When the glands can be removed entire, and the wound is not contaminated by pus from them, it may be closed with deep catgut sutures, silkworm gut being used to approximate the skin. Drainage for three or four days may be advisable.

Syphilitic adenitis of the primary or recurrent variety occurring during the early constitutional period seldom requires special local treatment. Sometimes absorption is facilitated by the application of a mercurial plaster. If suppuration occurs, treatment by the Iodoform emulsion is often beneficial. In late syphilis, the gummatous mass must not be opened, it being best to trust to internal medication and the application of mercurial plaster. If the gummatous bubo opens and discharges, the cavity should be irrigated with a 1-2000 solution of Bichloride of mercury, twice daily, followed by the application of an ointment composed of Ichthyol and Lanolin, of each one part, mixed with an equal amount of Unguentum hydrargri.

Tubercular adenitis may require enucleation. When suppuration is present the Iodoform treatment may be used to advantage. In the subacute and chronic forms, general hygienic, climatic and dietetic treatment, with *Baryta carbonica* or

muriatica, Silicea marina, Calcareo carbonica or Tuberculinum, internally, give the best results.

Malignant adenitis demands enucleation not only of the diseased glands, but of all the neighboring lymphatics, regardless of their condition. After removal of the diseased area, the parts should be X-rayed for some months to prevent recurrence of the disease.

The diet, hygiene and general care must always be reinforced by the administration of the symptomatically indicated remedy, which is usually one of the following :

Acidum nitricum acts well after Mercurius has failed and ulceration occurs. Ulcers remaining after the bubonic degeneration look worm-eaten, are painful, tend to spread and have everted, indurated edges. The granulations bleed easily. Especially useful in strumous and broken-down constitutions.

Acidum phosphoricum.—Bubonic ulcers with raised edges. Granulations pale and flabby. Edges thick, rounded and indurated.

Aconite.—Acute febrile condition, with local inflammation ; restlessness, anxiety ; strong, full, rapid pulse ; much and frequent thirst.

Alumina.—Gonorrhœal bubo, accompanied by yellow discharge from the urethra, with burning and itching, especially at the meatus.

Apis.—Inguinal glands swollen, hot and shiny, accompanied by great pain and sensitiveness.

Arsenicum.—Phagedenic and gangrenous bubo. Granulations red and elevated. Thin, offensive and ichorous discharge. Livid mottled appearance of the sore. Black slough. Burning pains. Margins bleed from the slightest touch.

Badiaga.—Indurated glands, uneven and hard as stones. Violent pains, like red hot needles through the glands.

Belladonna.—Glands enlarged, congested and inflamed. Swelling and throbbing pain in the inguinal region. Deep,

radiating redness of the skin, which disappears on pressure and slowly returns. Phlegmonous inflammation.

Carbo animalis.—Hard bubo, which threatens to suppurate, or even when there is fluctuation. Bubonic ulceration, with indurated edges and ichorous discharge.

Carbo vegetabilis.—Excessive prostration; parts livid or mottled.

Causticum.—Acrid, corroding pus. Systematic complications. Tendency to fungous growth.

Cinnabaris.—Sometimes useful when other mercurial preparations fail.

Graphites.—Glands painful, swollen and sensitive. In broken-down constitutions.

Hepar sulphur.—Bubo which does not heal. Suppuration threatened or inevitable. If given early, frequently prevents the formation of pus.

Kali iodatum.—Bubo. Glands swollen and indurated. Indolent or virulent ulceration. Thin, dark, corrosive discharge. Fistulous openings with foul discharge. Lymphatic, scrofulous or old syphilitic constitutions.

Lachesis.—Glands swollen, livid and mottled. Gangrenous and phagedenic ulcers. Broad, flat ulcers. Great prostration.

Mercurius.—Inguinal glands swollen, red, inflamed, painful and sensitive. Ulceration and suppuration take place rapidly. Mercurius bin-iodide and Mercurius corrosivus act best in chancroidal bubo.

Phytolacca.—Indolent bubo. Glands swollen. Inflamed ulcers with dry, lardaceous bases. General weakness.

Silicea.—Bubo which suppurates and is slow to heal.

Sulphur.—Old bubonic ulcerations which will not heal.

SECTION IV.

ANATOMY, ANOMALIES, INJURIES AND DISEASES OF THE SCROTUM.

Anatomy.—The scrotum is composed of integument, muscular and connective tissues. It develops from lateral halves which unite centrally in a raphé continuous anteriorly with the raphé of the penis and posteriorly with that of the perineum. The integument of the scrotum is of delicate structure and tends to become pigmented after puberty; its sebaceous glands are of large size and upon its surface hairs are sparingly scattered. Firmly attached to the inner surface of its integument is a layer of unstriped muscular tissue known as the dartos. At the raphé the muscular fibres of either side are reflected inward forming a separate compartment or pouch for each testicle. This division is known as the septum scroti. The space between the muscular layer and testicle is filled in with loose connective tissue practically devoid of fat, with here and there scattered fibres of the cremaster muscle. The lymphatics of the scrotum are numerous and large, and are in intimate association with the inguinal glands of the corresponding side. Its function is to contain and support the testicles.

ANOMALIES OF THE SCROTUM.

Malformations of the scrotum are rare, unless associated with defects of the penis or testicles. Occasionally the two lateral halves forming the scrotum fail to unite in the median

raphé and two pouches, each containing a testicle, result ; when the testicles are absent the lateral halves may resemble somewhat the external female genitalia, or present some of the features of pseudo-hæmaphroditism. When the testes have failed to descend, a shrunken scrotum results. Redundancy occurs from relaxation of the muscular dartos or from some diseased condition of the parts.

INJURIES OF THE SCROTUM.

Contusion of the Scrotum is frequently followed by extravasation of the blood into the loose cellular tissue, rapid swelling and discoloration. If the skin is abraded, suppuration may follow.

Treatment.—Rest in bed until the swelling disappears ; elevation of the scrotum ; retention of the testicles upon the pubic bones by a proper support ; pressure and the application of compresses saturated with a hot aqueous solution of Boric acid or Bichloride of mercury, 1-3000, together with the internal administration of Arnica, Aconite, etc.

Wounds of the Scrotum may be accidental or surgical. They always produce profuse bleeding.

Treatment.—All the bleeding points must be secured or hæmatoma will occur. In closing scrotal wounds, the margins of the integument must be perfectly adjusted to avoid inversion or eversion and consequent imperfect union. This end can always be attained by the use of the Helmuth scrotal stitch.

CUTANEOUS DISEASES OF THE SCROTUM.

Pediculi Pubis.—This pruriginous affection of the hairy parts of the genitals, commonly known as “crabs,” is due to the presence of the pediculus. The parasites multiply rapidly, are firmly attached to the skin, from which they draw their sustenance (appearing as minute scabs), and are most abun-

dant near the base of the penis. They may also locate upon the scrotum or any part of the body. The ova attached to the hairs can be seen with the unaided eye. The parasites and their ova are conveyed from one person to another during coitus, by means of the clothing, or even by the toilet. They cause an intense biting and itching sensation, and often some papular eruption. A suspicious itching about the genitals calls for immediate local examination.

Treatment.—A very satisfactory and rapid method of relief is to apply to the parts on retiring a cerate composed of one part of Mercurial ointment to three of Vaseline, care being given to protect the glans penis from the salve. The hair may be removed, although this is not necessary. The morning following the application the parts should be cleansed with soap and hot water. It may be necessary to repeat the treatment. Ammoniated mercurial ointment is equally efficacious, and its application is not so objectionable. A 1-1,000 solution of Bichloride of mercury in Cologne water applied to the parts every second day is very efficient, but it must be continued for two weeks. The daily application of a 1 per cent. solution of Sapodermin, in the form of a lather, which should be allowed to remain for fifteen minutes, is efficacious and will not injure the skin. The tincture of Delphinium staphisagria, Coccus Indicus or kerosene oil freely applied after a hot bath can also be used with satisfactory results.

Erythematous Intertrigo of the Scrotum.—This disease occurs especially upon fat, scrofulous children and adults who are fleshy, perspire freely, and are not careful in their personal hygiene, or are of a rheumatic diathesis. Rest, cleanliness and exposure to the air is often curative. It may be relieved by washing the diseased part frequently with a solution of Carbolic acid, 1-200, or Tincture of hydrastis, 1-20, and, after drying carefully, dusting with Oleate of zinc. An ointment of Resorcin, 2 per cent., made with equal parts of Lanolin and

Adeps, gives satisfactory results, the scrotum and thigh being separated by means of a suspensory bandage, the use of which should be continued for some time after healing has taken place. If the surface is moist and excoriated, it should be dusted frequently with a powder composed of equal parts of Camphor, Zinc oxide and starch.

Pruritus of the Scrotum.—This is a very troublesome condition, often occurring without appreciable reason. It may be dependent upon a gouty or rheumatic diathesis, or some error in diet or hygiene. It may be relieved by bathing the scrotum two or three times daily with a very hot aqueous solution of Carbolic acid, 1-200; one of Bichloride of mercury, 1-1000, followed by an ointment composed of Lanolin, 30.0, Zinc oxydati, Bismuth benzoici, 10.0, and Menthol, 0.5, or Rusc cerate, two or three times a week, together with change of air, general hygiene and the exhibition of the indicated remedy.

Eczema of the Scrotum.—In the gouty, rheumatic and diabetic this is of frequent occurrence; it may happen in those seemingly healthy. It is often exceedingly obstinate and is characterized, in addition to the general symptoms of eczema, by the most excessive itching and swelling of the parts, the surface of the scrotum becoming rough, raw, and developing deep rugæ.

Treatment.—The salves found most satisfactory for general use are :

℞ Zinci oxidi,
 Ungt. picis, aa ʒ j.
 Ungt. aq. rosæ, ad ʒ ij.

Or

℞ Zinci oxidi,
 Zinci carbonat., aa ʒ vj.
 Glycerini, fl ʒ iv.
 Liquor calcis, fl ʒ vj.

Sig. Shake well before applying.

Sometimes powders are preferred, such as **Calendulated talcum**, **Calomel**, **Bismuth subnitrate**, or

℞ Pulv. amyli,	3	vj.
Zinci oxidi,	3	jss.
Pulv. camphor.	3	ss.

Arsenicum album, **Calcarea carbonica**, **Mercurius solubilis Hahnemanni**, **Rhus toxicodendron**, **Sulphur**, **Thuja occidentalis**, etc., are the remedies most frequently indicated.

Eczema Marginatum.—This, according to Pick, is a parasitic disease, a combination of herpes tonsurans and intertrigo, affecting the scrotum, thighs, mons veneris and buttocks. It commences as one or more small, elevated, rounded, red, itchy patches between the scrotum and thigh. The involved area is soon covered by papules, vesicles, excoriations and crusts, surrounded by a characteristic, sharply-defined, festooned border. The patch heals in the centre and spreads from the circumference, the restored central portions remaining for some time somewhat brownish and scaly. New points or patches may appear within the central area or at some point external to the original lesion. Relapses are common and the eradication of the disease troublesome.

Treatment.—If there is much associated dermatitis, **Ungentum zinci oxidi**, or dilute **Lead water**, followed by an anti-parasitic lotion, *e. g.*, **Bichloride of mercury**, 1–2000 of **Cologne water**. A 2 to 4 per cent. ointment of **Turpeth mineral**, or tincture of **Iodine**, frequently repeated, are often beneficial. The treatment must be continued for a long period after the apparent cure or a relapse may be expected.

Pityriasis of the Scrotum.—This vegetable parasitic disease occurs especially during the summer months, attacking by preference those having delicate skins, producing a slight brownish discoloration of the scrotum and thigh where the two surfaces lie in contact. Often it causes a considerable degree of itching and erythema.

Treatment.—The condition is quickly cured by the daily application of dilute tincture of Iodine.

INFLAMMATORY DISEASES OF THE SCROTUM.

Inflammatory Scrotal Œdema.—Owing to the loose texture of the scrotal tissue and the dependent position of the parts, extensive œdema of the scrotum may accompany any inflammatory scrotal affection. It may be caused by traumatism, rupture of a hydrocele, by urinary infiltration, or by pressure from an inguinal adenitis; it is, however, usually due to some lesion of the kidney or heart and appears as one of their numerous general phenomena. The œdematous scrotum may become as large as a cocoanut and present a smooth, glistening, pale, tense surface, which pits on pressure. If this condition is not relieved it may become brawny, hard and infiltrated, blebs may develop, which break, and leave excoriated surfaces, or gangrene, with exposure of the testicles, may occur.

Treatment.—Support and protection should be given to the swollen parts and the cause, if possible, removed. Needle puncture under strict asepsis may be of benefit. If excoriations occur, the scrotum must be cleansed with an antiseptic solution and dusted with some mild drying powder. When due to urinary extravasation, immediate free drainage by a number of long and deep incisions into the tissues, evacuation of pus cavities if present and the removal of the cause by a perineal urethrotomy. Relief may be much accelerated by the administration, as symptomatically indicated, of *Apis mellifica*, *Apocynum cannabinum*, *Arsenicum album*, Sulphur or Iodine.

Cellulitis and Abscess of the Scrotum may complicate urinary extravasation or disease of the testicles, and should be treated on general surgical principles.

Erysipelas of the Scrotum is generally associated with a

similar condition in other parts of the body; in the aged or debilitated it may be the primary location. It may be the result of injury or arise spontaneously. The disease is announced by a pronounced chill, followed by septic fever and rapid pulse. A small red blotch appears upon the scrotum, which spreads rapidly and may in a few hours involve the entire scrotum; in a few hours the entire scrotum may become greatly swollen, mottled by sub-cutaneous hæmorrhages and covered with blebs. Gangrene may follow, the patient sinks rapidly, and death result.

Treatment.—Free incision of the parts together with frequently changed hot stupes of Carbolic acid, 1-100. In the mild form the scrotum must be supported, dusted with pulverized Amyli, and Arnica, Aconite, Belladonna, Arsenicum, Rhus tox., etc., administered as indicated.

Scrotal Gangrene.—This condition may be due to rupture of the urethra with consequent urinary extravasation; it may be a sequel of excessive traumatism without urinary extravasation, of frost-bite, pediculi pubis, a complication of prostatitis, diabetes, etc., be produced by pyogenic germs in the blood, as sometimes happens during influenza, erysipelas, etc., or be caused by embolism, thrombosis, etc. Occasionally it appears to be of spontaneous origin, though it generally occurs in those debilitated by excessive indulgence in alcohol. The scrotum swells rapidly; by the second day the heat disappears and the red color changes to a dusky hue, becoming black as the diseased part is separated from the healthy tissues by a line of demarcation. The tissue death may be so extensive that when the slough is thrown off the testicles and cord are largely exposed. Nature, however, is kind, and repair and recovering of the parts with skin is generally satisfactory.

Treatment.—Hot antiseptic stupes or poultices of flaxseed and charcoal should be applied until the slough separates, when the remaining integument must be drawn over the testes,

sutured as well as possible, and the parts enveloped in gauze moistened with a saturated aqueous solution of Boric acid or 1-4000 of Bichloride of mercury, which should be applied two or three times daily until the testes are covered in by granulation tissue. A selected diet to keep up the strength, with Liquid peptonoids, Hemaboloids, Whiskey, etc., should be given freely, together with Echinacea, Hepar sulphur, Silicea, etc.

Emphysema of the Scrotum.—Air may enter the scrotum from without through a punctured wound or from within from a rupture of an air-containing viscera. It may be unimportant. It is generally due to putrefaction within the scrotum and follows gangrene or sloughing.

Treatment.—Free incision, drainage and frequent douching of the diseased tissues with a solution of hot Bichloride of mercury, 1-5000, or of Electrozone, 50 per cent.

Lymph-scrotum (Egyptian Sarcocoele).—This œdematous engorgement of the scrotal tissues with consequent enlargement of the parts is caused by some mechanical interference with the lymph circulation. It is usually the sequela of a complete enucleation of the inguinal glands of both sides and closure of the wound by primary union. The œdema develops rapidly and may be sufficient to obliterate the natural conformation of the parts.

Treatment.—Cold applications, cold baths, a proper suspensory bandage, and the administration of *Apis mellifica*, in the acute forms, often act satisfactorily. In chronic cases, surgical removal may be required.

Elephantiasis of the Scrotum.—This hypertrophied overgrowth of the scrotum is of rare occurrence in this country. The colored races are especially afflicted. It is generally due to stoppage or plugging of the lymphatics by the ova of the *filaria sanguinis hominis*, though obstruction from other causes, such as syphilitic deposits and some inflammatory

conditions, followed by cicatrization, etc., It commences as a hard circumscribed n lower part of the scrotum. Prunner says: this kernel spreads in all directions the sk thickened and indurated, and appears furro wrinkled and granular. At this period also the abdomen becomes altered in form while ties appear to be getting shorter, a result of 1



FIG. 11.—Elephantiasis of the Scrotum. (Thorington.)

the tumor exercises on the skin of the abdomen. In the same way the skin of the penis yields to the traction of the tumor and turns downward, beginning at the root, hence this organ diminishes in length externally until it is completely hidden in the tumor. Its cutaneous covering is connected merely to the glans and forms a blind canal, whose aperture is situated in front in the middle line of the tumor, and represents a kind of continuation of the outer extremity of the urethra. The

skin of the penis, however, in consequence of the contact of the urine, becomes converted into mucous membrane."

Elephantiasis of the scrotum originates in recurrent attacks of local dermatitis and œdema, with a varying degree of fever, which leaves a brawny patch, that increases in size with each exacerbation.

As the growth develops it forms a large, rough, warty, uneven and often excoriated pyriform tumor (Fig. 11). The position of the growth compels the urine to flow over it, the skin becoming macerated in consequence and abrasions result. The parts often attain an enormous size, in one case the growth weighing over two hundred pounds.

Treatment.—Galvanism has sometimes been beneficial in the early stage. When the growth is large and troublesome, removal is generally advisable. As the operation is frequently attended with profuse hæmorrhage requiring the ligation of many vessels, the scrotum at the base of the tumor should be transfixed with long pins and an elastic band placed behind them to control the bleeding during the operation. The hypertrophied tissues must be carefully separated from the testicles and penis, the vessels secured and the parts dressed surgically. In time, granulation tissue will cover and protect the testes.

TUMORS OF THE SCROTUM.

Molluscum Contagiosum.—This is usually a disorder of childhood. The disease appears as small sessile or pedunculated waxy tumors or cysts in the superficial layers of the skin. At first they produce few subjective symptoms; later they soften and become umbilicated, the depressed centre being marked by a black spot.

Treatment.—If pedunculated, the growth should be removed with the curved scissors and the base cauterized with pure Carbolic acid. If sessile, the contents must be evacuated

at the black-pointed centre by pressure and the cavity swabbed with pure Carbolic acid.

Sebaceous Cysts or Steatomata.—These occur usually in adult and advanced life. Generally there is only one cyst of small size, though it may become as large as a crab apple. They are soft and doughy in consistency; should they by any means become inflamed, suppuration may follow.

Treatment.—Incision and removal of the sac with its contents.

Malignant Disease of the Scrotum rarely occurs except among the chimney sweeps of England. It is believed to be largely due to their dress, as the continuous contact of soot with the scrotum of men in other countries rarely produces it. The disease begins as a warty growth which gradually invades the scrotum and penis, accompanied by thickening, excoriation and ulceration of the parts. Melanotic sarcoma of the scrotum or a cancerous involvement secondary to disease of the testis or cord is not uncommon.

Treatment.—The diseased parts with all involved lymphatic glands must be extirpated. Arsenicum album, Aurum iodide, Conium and Condurango sometimes seem to relieve the pain and retard the extension of the disease.

SECTION V.

ANATOMY, ANOMALIES, INJURIES AND DISEASES OF THE TESTICLES.

Anatomy.—The testicles with their epididymi are somewhat egg-shaped, being about one and three-quarters inches long, one and one-quarter inches antero-posteriorly and one inch transversely. Their average weight is about six drachms. They vary, however, greatly in size, usually being largest in men with an erotic temperament. They are soft and yielding in the state of repose; firm and elastic during venereal excitement. When squeezed there is produced a faint, sickening feeling. Each is suspended by its spermatic cord and lies loosely in its scrotal sac. The left is generally a trifle larger and hangs a little lower than the right, its position being a provision of nature to allow escape of the organ and prevent injury in case of scrotal compression. In transposition of the viscera it has been noticed that the right testicle hung lower than the left.

The testicle has two coverings, the tunica vaginalis and the tunica albuginea. The tunica vaginalis is a closed serous sac which surrounds the glandular portion of the testicle except where it is attached to the epididymis behind and the gubernaculum below. Posteriorly it dips between the epididymis and testicle forming a cul-de-sac at the bottom of which the sac and the two sides come in close contact. On the outer side the tunica vaginalis covers the epididymis, the reflected layer extending up the cord terminating in a closed end. The tunica vaginalis is that portion of the peritoneum which the testicle has pushed before it in its scrotal descent. Gener-

ally by birth it has become completely separated from the peritoneum above, a white fibrous line, the habenula, alone marking the original connection of the membrane. Sometimes there is only a partial closure of the sac which permits of the interchange of fluids, etc., between the pouch of the tunica vaginalis and the abdominal cavity. The tunica vaginalis is lined with pavement epithelium and contains a trifling amount of fluid which facilitates the easy motion of the testicle within it. The tunica albuginea is a dense, white, fibrous tissue, very slightly extensible, which invests the glandular portion of the testicle and sends into its substance trabeculæ, breaking it up into about four hundred compartments for the lodgment of the tubuli seminiferi. In its substance are lodged the branches of the spermatic artery, which are finally distributed to the contained tubules. Above and behind it forms the mediastinum where the vessels pass to and from the testicles and the straight tubes come out to form the coni vasculosi in the head of the epididymis.

The compartments formed by the fibrous septa of the tunica albuginea contain numerous little tubes closely packed in conical segments. They are called the tubuli seminiferi and are estimated to number from two hundred and fifty to five hundred, the combined length of these canals being estimated at from one thousand to five thousand feet. The diameter of each tubule is estimated by Muller as one eighteenth of a line, and their length by Lauth at twenty-five inches. The tubes are convoluted and anastomose with their fellows of the same and neighboring cones. They have a hyalin membrana propria within which are several layers of epithelial cells. The external layer is polyhedral, the internal spherical; they are known as spermatoblasts, and from them the spermatozoa are evolved. A section of one of these tubes reveals the stages of the process by which a spherical cell becomes pear-shaped, tailed and finally a fully developed spermatozoa. The tubes

from the apices of the cones unite to form twenty or thirty conducting tubes called the vasa recta, which run straight into the fibrous mediastinum, there forming an irregular network of channels without distinct walls, the rete testis. The ducts issuing hence are known as the vasa efferentia; they pierce the tunica albuginea and converge to form the epididymis.

The head or globus major of the epididymis lies over the top of the testicle, forming the broadest part of this portion of the organ. It is formed by the dilated and convoluted cones known as the coni vasculosi. They begin where the vasa efferentia make their exit through the tunica albuginea. These canals unite to form one duct whose convolutions form the body of the epididymis; it is separated from the testicle proper by the cul-de-sac of the tunica vaginalis. At the lower part of the epididymis the convoluted mass becomes larger, forming the globus minor or tail. This portion of the epididymis is attached to the testicle by a varying amount of connective tissue.

The epithelium lining the canal of the epididymis is of the ciliated variety, its function being to sweep the contents of the canal forward. This canal terminates in, and is continuous with, the vas deferens. The blood supply is derived from the spermatic artery. The nerve filaments are derived from the lumbar plexus of the sympathetic; the lymphatics are connected with the lumbar glands.

The function of the testicles is the production of spermatozoa for the vitalizing of the seminal fluid. They also exert a special tonic influence upon the sexual and general systems. As age advances, sclerotic changes occur in the connective tissue composing the stroma of the testes, together with fatty degeneration of the epithelium lining the glandular portion of the testes and the epididymi, producing gradual loss of function. The time at which virility ceases depends upon the hygienic care which the individual has observed and his con-

tinued freedom from disease. Sturges reports cases of undoubted virility long past the century mark.

ANOMALIES OF THE TESTICLE.

With few exceptions men have two testicles. When an extra one is present, the condition is called polyorchidism. A few such anomalies have been reported, but the autopsy usually demonstrates the third testicle to be a cyst or other tumor. When one or both testicles are absent, the malformation is called anorchidism. In the cryptorchid, one or both testicles are absent from the scrotal pouch but present elsewhere. The monorchid is a unilateral cryptorchid. Anorchidism is due to non-development of the testicles; cryptorchidism to the retention or displacement of the testicles during their descent into the scrotum. The cryptorchid has the ability to perform the sexual act but is generally sterile; the monorchid has full sexual powers.

During life positive differentiation of anorchidism from abdominal cryptorchidism is impossible. In the anorchid the glandular portion of the testicle only may be absent or it may include any part or all of the epididymis, vas or seminal ducts.

Synorchidism or fusion of the testicles is extremely rare and can only be positively diagnosed by finding the two cords attached to the double testicle.

Treatment.—Cryptorchidism resulting from non-descent of the testicles causes no unusual illness and requires no special treatment. Anorchidism dependent upon non-development and consequent congenital eunuchism is incurable.

Inversion of the Testicle.—In this anomaly, the testicle, in its descent, assumes a faulty position. The displacement may be anterior, lateral or transverse, the last being the more frequent. The rotation may be so complete that the epididymis is placed in front of the testicle.

Retained Testicle.—It rarely happens that the testicles

are retained within the abdominal cavity at birth, the organs generally descending from their original locations along the inguinal canal into the scrotum about the seventh month of foetal life. When not present in the scrotum at birth they usually appear during the first few weeks. After the first



FIG. 12.—Inguinal Ectopy Testis.

year descent is uncommon. They have, however, been known to descend as late as the twenty-fifth year. One or both testicles may be retained within the abdominal cavity (abdominal retention), at the internal ring (internal in-

guinal retention), at the external ring (external inguinal retention), or in the inguinal canal (inguinal retention). (Fig. 12.) The testicle may not fully descend into the scrotal sac (scroto-crural retention), or it may be misplaced, lodging beneath the skin some distance from the external abdominal ring, in the perineum (perineal retention), in the crural or

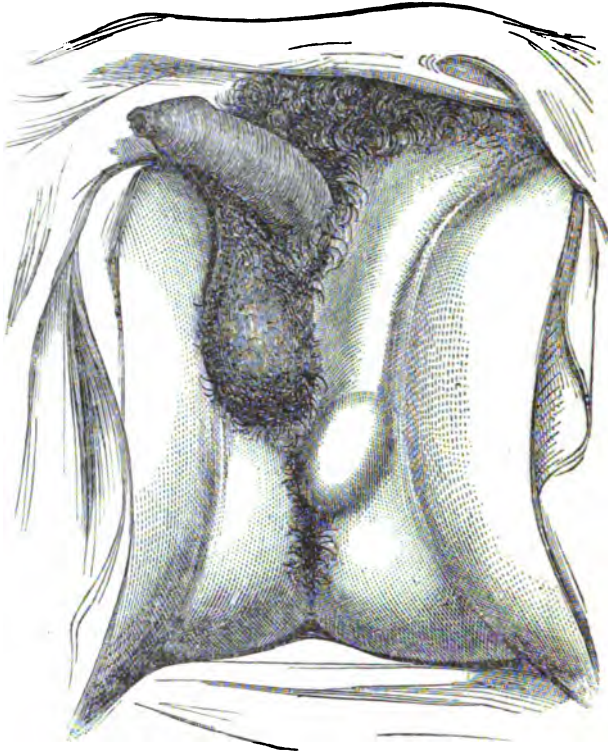


FIG. 13.—Perineal Ectopia. (Godard.)

possibly in the femoral region (femoral retention). When retained in the abdominal cavity it may be attached to the posterior abdominal wall beneath the kidney in the iliac fossa (iliac retention), within the internal ring or attached by

a long mesorchium and floating in the abdominal cavity. When the testicle is retained in the inguinal canal or at the internal or external ring, it is generally quite movable, unless it has been fixed by a previous inflammatory condition resulting from some injury. At birth the retained testicle is usually structurally perfect, but by early manhood it undergoes a varying degree of fatty or fibrous degeneration.

Ectopy Testis.—Misplacement of the testicle is due to some deviation of the organ from its normal course in its descent. The causes are numerous—shortness of the vessels of the cord, a long mesorchium, the small size of the external or internal ring, irregular development of the gubernaculum testis, etc.

In perineal ectopy (Fig. 13), the testicle appears as a small ovoid mass at one side of the median raphe in front of the anus; when pressed upon, it gives the peculiar sickening testicular pain. Its spermatic cord can often be traced. In femoral ectopy, the testicle occupies the position of a femoral hernia just below Poupart's ligament and behind the femoral vessels. Misplaced testicles are always undersized, generally somewhat atrophied, and, from their abnormal positions, are especially liable to inflammation, which often results in degeneration, disease, etc. As a rule, displacement of the testicle produces sterility but not impotence. With the exception of an occasional pain in the misplaced organ and its absence from the scrotal pouch no symptoms occur until some complicating disease develops, the most frequent and distressing being an epididymo-orchitis with its agonizing sickening pain and reflexes.

Treatment.—Operative measures to correct the position of undescended and misplaced testicles are in early childhood advisable. In the adult, on account of the location of the organ, its liability to subsequent traumatism and resulting degeneration, castration is preferable. Particularly is this true

if ectopy testis accompanies hernia, except where there is reason to believe that there is but one testicle, when the organ should be saved, even though the risk is considerable. The abdominal variety should remain undisturbed unless evidence of disease appears, the vascular and nerve attachments of the testicle being often too short to allow it to be properly secured at the bottom of the scrotum. Operative relief has, however, been successful, with subsequent growth and development of the organ, yet there have been numerous failures, and in 10 per cent. atrophy follows. In young subjects, when the testicle is within the inguinal canal, or the misplacement is of the cruro-scrotal variety, and it can be forced down into place or partly so, a correction of the deformity may be expected from daily attempts to replace the testicle. At first the organ will immediately return to its improper location, but after a time the gubernaculum and undeveloped cord may increase sufficiently in length to allow the testicle to remain in its normal position, though it will take a year or more of daily effort to accomplish it. Manipulation and the application of a proper truss to keep the gland in front of the external ring may be successful.

Orchidopexy.—In the bilateral variety of ectopy testis this operation is rarely indicated; when it is unilateral, and when the testicle is within the external ring, it is sometimes necessary. The incision is made along the line of the cord, through the skin, superficial fascia and aponeurosis of the external oblique and over the testicle, which is exposed and the cord thoroughly freed. A transverse incision carried through the fibres of the cremaster muscle and those covering the cord entirely liberates the testicle with its nerves and vessels, and allows the organs to be extended beyond the ring; the areolar tissue of the scrotum is then separated by forcing the forefinger down from the lower corner of the wound; the scrotal sac thus formed is invaginated and the testicle attached to its

base with a chromicised catgut ligature. The opening in the external oblique is closed and the external ring reduced sufficiently, by the buried catgut sutures and the folding of the loose scrotal connective tissue about the cord, to prevent retraction through it of the testicle, care being taken not to cause strangulation of the parts. The external wound is closed and surgically dressed.

Perineal ectopy always calls for surgical relief. It is usually best to operate about the tenth year, though if the misplaced testicle interferes with exercise it may be advisable earlier. After the patient is prepared for operation and placed in the lithotomy position, the testicle is pushed as near the scrotum as possible, and an incision about an inch and a half long, transverse to the cord and at right angles to the raphé, is carried through the tissues down to the cord. The testicle and vessels are exposed, freed from attachments, and, after a passage is forced by the finger from the upper edge of the wound through the cellular tissue to the bottom of the scrotum, the testicle is deposited in the newly-formed sac and anchored in the usual manner.

Pubic ectopy requires practically the same attention as the inguinal. The crural is generally associated with hernia. The testicle may be returned with the intestine to the abdominal cavity or removed, as may seem best.

When an undescended testicle becomes inflamed, the usual methods of treatment for the normally placed testicle may be all-sufficient. When the progress toward resolution is unsatisfactory an exploratory incision will be advisable. Hernial complications require herniotomy with castration. Malignant complications call for immediate removal.

INJURIES OF THE TESTICLE.

Luxation of the Testicle.—This is not a common accident ; it may be produced by a general traumatism or result from

overaction of the cremaster muscle forcing the testicle **into** the external abdominal ring, the inguinal canal or even **into** the abdominal cavity. The dislocation is accompanied **by** pain extending from the loins into the testicle, etc.

Treatment.—The organ should at once be returned to **its** normal position and secured by means of bands of adhesive plaster wound around the scrotum between the testicle and **the** base of the scrotum, or if anchorage is deemed necessary, **the** cremaster muscle should be incised and the testicle sutured to the bottom of the scrotal sac.

Torsion of the Testicle.—Axial rotation of the spermatic cord is believed to depend primarily upon some congenital defect of the testicle or spermatic cord; it may follow over-exercise or undue muscular effort. The twist may be either to the right or to the left, and varies from an incomplete to three or more complete revolutions. When not immediately relieved it results in strangulation and gangrene. The symptoms are those of a severe epididymo-orchitis, with faintness, vomiting and exquisite sensitiveness and swelling of the parts. The symptoms appear during or immediately after some unusual muscular effort, with the absence of other or sufficient cause for the acute inflammation. It is often mistaken for strangulated hernia. Immediately after the accident, the thickened condition of the cord and even the twists may be distinguished through the scrotal wall by manipulation.

Treatment.—In a normally situated testicle, if torsion occurs, the cord can generally be untwisted under an anæsthetic without resorting to the knife, the parts resuming their normal state. If an exploratory incision is necessary and the testicle has become black or gangrenous, it must be removed; if it is only swollen or discolored, it is conservative surgery to only relieve the distortion.

Wounds of the Testicle.—Incised wounds are exceedingly rare, except when made surgically for diagnostic purposes.

Punctured wounds are often accidentally caused by the improper use of the trocar, and are unimportant if the instrument was aseptic.

Treatment.—When the parenchyma is normal, the tunica albuginea should be carefully and evenly sutured with catgut, and the wound closed without drainage. Contused and lacerated wounds require careful drainage.

Contusions of the Testicle.—Bruises of the testicle may be produced by the organ being squeezed or pressed up violently against the perineum, pubes, etc. The symptoms depend upon the degree of traumatism and the quantity of blood extravasated. The pain varies from a slight sickening sensation, soon forgotten, to intense agonizing pain, accompanied by nausea, vomiting, faintness, rapid swelling of the parts, followed by abscess or gangrene, profound shock and even death.

Treatment.—Contusions of moderate degree should receive evaporating lotions, support of the scrotum and elevation of the pelvis. When severe, application of hot stupes of Lead water and Alcohol, or solutions of hot Boric acid. The ice bag is frequently very serviceable. The bowels must be kept open and a milk diet enjoined. Until all the inflammatory symptoms have subsided, confinement in bed should be advised and a proper suspensory must be worn for months after. Arnica, Aconite, Belladonna, Veratrum viride, etc., are all efficacious in relieving the pain and subduing the inflammation.

DISEASES OF THE TESTES.

Hypertrophy of the Testicle.—When only one testicle has developed, or when one has been removed at an early age by surgical means or disease, the remaining testicle, following the law of compensation, often increases somewhat in size and does duty satisfactorily for both. Hypertrophy of the testicles may occur without apparent cause. When there is hyper-

trophy, a suspensory bandage, to prevent dragging upon the spermatic cord, should be worn at all times.

Atrophy of the Testicle.—This is usually the result of orchitis, old age or wasting disease. It may follow epididymo-orchitis due to tonsilitis, gonorrhœa, traumatism, non-inflammatory pressure from a hydrocele, hæmatocele, varicocele, hernia testis, tumors, syphilitic or tubercular involvement, etc. In one of the author's cases, true complete atrophy and entire disappearance of both testicles occurred after mumps. The process was slow, extending over a period of four years, during the first three of which the sexual powers were not pronouncedly impaired.

True atrophy is generally a result of retention or ectopy testis; sometimes, however, when placed normally, the testicles remain undeveloped. Daily moderate massage or the use of a light Faradic current, continued for months, may be of benefit. The natural physiological activity of the testicles in married life has often induced satisfactory development. The prognosis is always unfavorable.

Hæmorrhagic Infarction of the Testicle.—In children, it is due to thrombosis of the pampiniform plexus of the spermatic cord. It sometimes occurs in infants immediately after birth, even when the labor has been easy. In the adult, it may result from infectious thrombosis or torsion of the cord.

Clinical History.—The testicle swells rapidly and becomes two or three times its normal size; there is little accompanying pain.

Treatment.—The internal administration of Arnica or Hamamelis and external applications of hot solutions of the same drugs generally produce rapid resolution.

INFLAMMATION OF THE TESTICLE.

When the inflammation involves the secreting portion of the testicle alone it is designated as an orchitis; when it commences

in the testis and extends to the epididymis, an orchiepididymitis; if it affects the epididymis with but slight involvement of the testis, an epididymitis, epididymo-orchitis or swelled testicle. Inflammation of the testicle may be classed as simple, gonorrhoeal, tubercular or syphilitic.

Epididymitis.—Etiology.—Posterior gonorrhoeal urethritis is the most frequent exciting cause of the swelled testicle. It is due to the inflammatory condition traveling back through the seminal canals to the epididymis; it appears from the third to eighth week of the disease. It may also occur as the direct result or complication of the milder varieties of urethritis; it is often induced by lifting during an attack of any urethral inflammation; from instrumentation or surgical operation in or around the prostate and the neck of the bladder. It may be caused by the introduction of urethral instruments, even under the most approved technique, into a urethra damaged by disease, excessive venery, exposure to wet and cold, the use of strong urethral injections, excessive and ill-advised urethral injections and irrigations, traumatism, etc. Predisposing causes include chronic urethral lesions, calcareous concretions in the prostatic urethra, acute or chronic prostatitis, gouty or rheumatic conditions of the system, etc. The infection from a chronic urethral, prostatic, seminal or vesical disease, even without recognized exciting cause, may be responsible for some of the so-called attacks of relapsing epididymitis, perhaps due more to the absorption of the toxins and their conveyance by the lymphatics to the delicate epididymis than to the gonococcus. The first attack predisposes to another and relapses are frequent.

Pathological Anatomy.—In the epididymis the tubes are distended by an inflammatory, homogeneous plastic exudate, desquamated epithelium and pus. The globus minor is usually more acutely involved than the rest of the organ, the connective tissue between the tubules being infiltrated and œdematous.

ous. The secreting portion of the testicle, however, **while** very hyperæmic, rarely becomes inflamed. As the inflammation subsides the œdema and inflammatory exudate are **absorbed**, though, to some extent, there is a resulting occlusion of the ducts of the epididymis, one or more hard nodules **remaining** in the epididymis, particularly in the tail, to **mark** the location of the centre of inflammatory invasion. **This** inflammatory lesion rarely terminates in suppuration.

Clinical History.—As epididymo-orchitis is frequently a complication of acute gonorrhœal urethritis, it happens most frequently between the twentieth and the fortieth years. It is generally limited to one side. When both organs are attacked, the involvement of one side usually precedes the other by a few days or weeks. The severity of the attack varies from one which allows attention to business, the inflammation being confined almost exclusively to the epididymis, there being no accompanying fever (sub-acute), to one, which, on account of the extensive inflammation, fever, etc., compels rest in bed for two or three weeks (acute). The first attack is usually severe; subsequent attacks, sub-acute. The disease is often announced by a slight uneasy feeling located in the groin and extending up the back. On manipulation, the epididymis will be found sensitive and possibly swollen. There may be some rise in the temperature, increased frequency of micturition and pain in the perineum and scrotum. After a few hours the globus minor or the whole epididymis increases in size, with pain in proportion to the amount of effusion into the epididymis and the distension of the tunica vaginalis with lymph. As the exudation of plastic material becomes more extensive, the epididymis envelops, as it were, the testis, which also becomes congested and œdematous, giving an irregular outline to the inflamed organ. It may attain the size of the fist, or the swelling may be confined to the tail or head of the epididymis. The inflammation is

accompanied by pain, dragging, agonizing and sickening in character, greatly aggravated by standing or locomotion, sometimes causing faintness, and is relieved only by the patient assuming the recumbent position with support of the scrotum. The whole organ is sore and sensitive to touch, so much so that the patient will unconsciously support and protect it with the hand. (Fig. 14.) As the



FIG. 14.—Epididymitis.

disease advances the epididymis becomes extensively attached to the inflamed testicle and the scrotum becomes red, swollen and œdematous, the veins standing out tortuous and prominent.

The temperature ranges from 99° to 103° Fahr. In the

acute variety of epididymitis the adjacent tunica vaginalis is to a varying degree inflamed, and a considerable amount of fluid is poured into the sac. Sometimes the amount of fluid is excessive, producing a tumor the size of a large orange, obscuring the condition of the testicle; while it may fluctuate it usually produces no pain, and generally is rapidly absorbed as resolution occurs. It may be attended by excruciating pain, which is only relieved by a puncture of the tunica vaginalis and evacuation of its contents. If a urethritis existed before and was the cause of the disease, the discharge will decrease or stop, to return on the cure of the local inflammation.

The inflammation advances for from two to six days, but is generally relieved or cured in about two weeks; the pain subsides long before there is any reduction in the size of the inflamed organ, though it will return if the erect position be assumed too early or when the testicle is not properly supported. In the old and debilitated, the plastic exudate into the epididymis may undergo purulent degeneration and terminate in abscess or sloughing. This form of epididymitis does not respond to treatment, but the organ continues to swell, becomes dark red in color and often attains the size of a cocoanut. If the pus is not liberated it will ultimately open externally. This variety of epididymo-orchitis is often caused by and follows improper catheterization.

Relapsing epididymo-orchitis, usually of the sub-acute variety, is the concomitant of chronic seminal vesiculitis or catarrh of the prostatic urethra.

The inflammatory induration in the tail of the epididymis may persist for years. By its mere presence or future contraction it may occlude, in part or entirely, the tubes of which the tail is composed; if both testicles are affected it may cause sterility. Fortunately, the occlusion is rarely complete, even when the conducting tubes of both have been diseased.

The testicles always retain their power of secretion, even when the efferent tubes are completely obstructed, and if, at any future period, the canal is opened, the spermatozoa will again make their appearance in the seminal fluid. Obstruction of the ducts of the epididymis does not in any way interfere with the act of copulation or the ejaculation of a seminal fluid, though the spermatozoa will be absent. Microscopical examination of the seminal fluid of a large number of men has demonstrated that even in double epididymo-orchitis, when treatment is continued, in from two to eight months the spermatozoa may again be found in the semen. The nodule remaining in the tail of the epididymitis may for some time, with changes in the weather, be very sensitive and irritable, the least touch producing the most agonizing pain.

Epididymo-orchitis is generally accompanied by some swelling and inflammation of the spermatic cord, "deferentitis." It may extend up into the inguinal ring, though, when the scrotum has been properly supported, it is rare for the cord to become larger than one-half inch in diameter. The excessive tumefaction may produce an inflammatory strangulation, recognized by fever, vomiting, pain, shock, etc. The application of leeches or puncture of the tense and inflamed cord may be required to give relief.

Traumatic epididymo-orchitis may be the result of direct violence, follow a strain from overaction of the cremaster muscle, or may be due to the pinching of the spermatic cord against the fibrous external opening of the inguinal canal. The left testicle is usually the most frequently involved. The disease may be quite acute, with symptoms varying only slightly from those of the gonorrhœal variety, or it may run a more chronic and less painful course. Atrophy of the testicle frequently follows.

Prognosis.—The average duration of the disease is from two to three weeks. There is no danger to life, sexual power

is not impaired, though sterility or neuralgia of the testicle may follow. In the chronic relapsing form it may persist for two or three months.

Treatment.—Rest and proper support of the scrotum are the earliest requirements. When the dragging sensation in the inguinal region and cord, with pain in the perineum and frequency of urination, announce the commencement of an epididymo-orchitis, it can often be aborted by a hot bath, proper support of the testicle, with rest in bed for a day or two, light diet and the administration of Aconite, Belladonna, Pulsatilla or Clematis. If the inflammation is not controlled, the scrotum may be painted twice daily with a solution of Guaiacol, one part, and Glycerine, two parts, full strength Guaiacol being applied over the cord, which often quickly relieves the pain. When the pain is due to an associated acute hydrocele immediate relief can be procured by puncturing, "under proper aseptic conditions, the tense tunica vaginalis with a small trocar and canula, and allowing some of the fluid to escape, or the fluid may be withdrawn by means of the aspirator. When the pain is not severe the scrotum may be wrapped in cotton, covered with oiled silk and retained in a shallow suspensory bandage, with side laces to give gentle, equable and continuous pressure. This dressing gives rest, heat and pressure to the parts, and often allows a patient with a sub-acute epididymitis to continue at his daily vocation. In some of the acute and many of the relapsing forms of epididymitis, the daily application of a salve composed of 20 per cent. Guaiacol and 80 per cent. Lanolin, and dressed as above, will give relief. Acute epididymo-orchitis is best treated by elevation and retention of the testicles above the pubes, rest in bed and the application every two hours of hot poultices made of tobacco and flaxseed, in proportion of one to sixteen, large enough to completely envelop the scrotum. The poultice must be about one-half inch thick, and for cleanliness should

be covered with cheese cloth. The addition of a little powdered slippery elm makes the poultice more agreeable. It should be held in place, its warmth and moisture retained and the inflamed organ supported by the author's rubber poultice pouch (Fig. 15). Tapes from the two anterior triangles are attached in front to a band of muslin six inches wide pinned around the waist, while the two tapes attached to the poster-

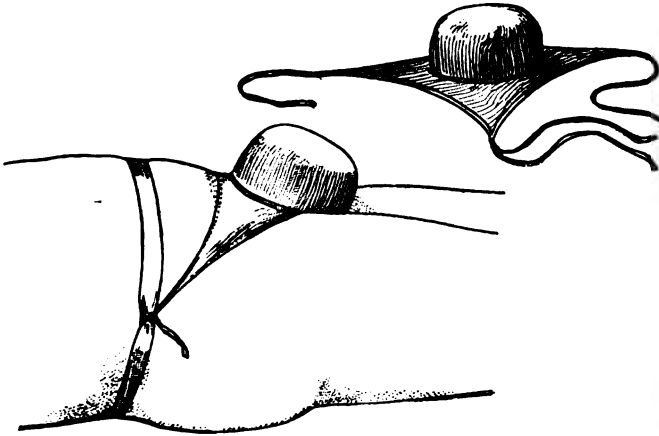


FIG. 15.—Scrotal Poultice Bag. FIG. 16.—Application of Scrotal Poultice Bag.

ior point are tied in the back. The pouch gives support (Fig. 16), retains the moisture, maintains continuous and even pressure, and prevents soiling the clothes. The poultice may be covered with cotton or flannel, then with a piece of oiled silk, and be retained in position by a large silk handkerchief folded from corner to corner, the base of the triangle thus formed being placed under the scrotum and the ends tied in the median line to a band surrounding the body above the hips, and the apex of the triangle brought up and also tied to the body band at the same point. If the patient is restless, a tape should be secured to the central perineal point and be carried up between the nates and tied to the band about the

waist posteriorly. This simple device supports the **scrotum** and permits free movement about the bed without danger of dislodging the poultice. A suspensory bandage is insufficient and pillows between the legs are uncomfortable and do **not** allow the patient to move. Hot fomentations of Hamamelis or Lead and Opium water applied in the same manner as a poultice act very satisfactorily. The ice-pack is often used **in** the early stage to relieve pain and reduce inflammation, but, **if** continued too long, it may cause neuralgia of the cord; it **is** contra-indicated when the vas deferens and the seminal vesicles are involved.

After the pain has subsided the decrease in the swelling may be hastened by the application to the scrotum of a paste made of equal parts by weight of Belladonna and Mercurial ointment, Ichthyol and Lanolin, spread upon lint, and covered with lamb's wool and retained in place by a suspensory bandage, which at the same time supports the organ. The local use of Ungentum belladonna, the Paquelin, etc., have been advocated. When double epididymo-orchitis exists, to avoid, if possible, permanent occlusion of the tubes in the epididymis, it is advisable to continue the salve until the swelling remains stationary or it entirely disappears; if ointments are objectionable, after the scrotum has been cleansed with hot water and green soap, the hairs cut close with the scissors and the parts douched with a warm, aqueous solution of Bichloride of mercury, 1-2000, and dried, the organ can be painted with Nitrate of silver, sixty grains to the ounce of water, covered with a layer of absorbent cotton, and supported by the proper suspensory bandage, with very gratifying results. If the swelling does not practically disappear by the seventh day, the local treatment may be repeated. Some good effects have been obtained from the daily application of an ointment of Nitrate of silver, 1-10. The secondary Faradic current, with a coil of at least fifteen hundred yards, is sometimes applied to advan-

tage. This disease cannot be considered cured unless all induration in the epididymis has entirely disappeared, a result rarely attained.

When pain has ceased, strapping to reduce the swelling is advocated by some. When it is considered expedient, the hair is removed from the scrotum and the organ made aseptic. Strips of adhesive plaster, about an inch wide and six or eight inches long, are cut. The spermatic cord is encircled about the swelling with the left hand or by an assistant, pushing the tumor well down into the scrotum, making the parts tense and firm. A piece of muslin bandage is then carried twice around the swollen parts at the upper border and fastened at the end by a piece of adhesive plaster. This cotton bandage prevents the adhesive straps cutting into the tissue. The straps are applied encircling the upper part of the scrotum, overlapping one another from above downward, until a little below the centre, when the strap must be carried under the scrotum so as to draw the pendulous part upward. The dressing is completed by a single strip encircling the scrotum to hold the ends. Pain sometimes follows the strapping, but it usually passes off in an hour or so. The parts should be supported by a suspensory bandage. The straps should be removed in from twenty-four to forty-eight hours, or whenever they become loose. Edema of the pendulous portion of the scrotum may be noticed on removal of the straps, but it is not, as a rule, of any consequence. When the organ has been strapped and much pain follows, the straps must be at once removed, as over-tight strapping has caused gangrene.

When the epididymitis is due to a chronic spermato-cystitis or prostatitis, a vasectomy may be required to prevent the frequent recurrence of the disease caused by waves of inflammation extending down the vas.

When an abscess forms the pus must be evacuated, proper

drainage instituted, and the cavity surgically dressed **twice** daily.

The following internal remedies materially modify the inflammatory condition and often cure without local adjuvants:

Arnica is particularly useful in traumatic epididymo-orchitis, the parts being swollen, indurated and tender.

Belladonna.—Acute inflammation of the testicle, the parts being swollen, congested and indurated from inflammatory exudation, accompanied by excessive throbbing, stitching, neuralgic pains; hot and very sensitive to touch.

Gelsemium.—Swollen testicle caused by gonorrhœa or exposure, with fever and depression.

Hamamelis.—Internally and locally acts very kindly, the scrotum being swollen, red, hot and shining, the veins swollen and inflamed; severe neuralgic pain almost unbearable, often extending into the abdomen, causing nausea and vomiting; pain is worse at night and during rainy weather; temperature is usually not high.

Hepar sulphur.—Should be given if there is a tendency to abscess formation, until resolution occurs or all necrosed tissue is removed, when it should be replaced by *Silicea*.

Pulsatilla is more frequently indicated and prescribed than all the other remedies combined; it is indicated for the swollen testicle caused by gonorrhœa, and in epididymo-orchitis of hæmatogenic origin; it is efficacious in painful swelling of the testicle and vas deferens; the testicle is so sore that the touch of the clothing cannot be tolerated; pressive, tensive, tearing pain in the parts, shooting down the thighs, along the groin and into the back; scrotum dark red and swollen; absence of thirst with the fever.

After the acute symptoms have subsided, the absorption of the inflammatory exudate and relief of the neuralgic pains will be facilitated by *Clematis*, *Iodine*, *Mercurius* or *Sulphur*.

Acute Orchitis (Orchi-Epididymitis). — This malady is usually of hæmatogenic origin, attendant upon some systemic infectious disease, such as mumps, influenza, tonsilitis, small-pox, typhoid fever, rheumatism, etc. It may be due to traumatism.

Clinical History.—The inflamed testicle increases in size, but retains its ovoid contour, becoming hard, firm, tense, and smooth, the epididymis being stretched out over the swollen testes and indistinguishable. The enveloping scrotal tissues are often inflamed, red and swollen. The accompanying pain, which is due to pressure from within upon the tunica albuginea, is excessive and often agonizing. Manipulation of the organ may cause faintness. Elevation of the parts does not relieve the pain. It generally subsides gradually as the inflammation is subdued. It may stop suddenly. The fever is high sometimes for three or four days; it may be very high and accompanied with anorexia, nausea, vomiting, delirium, etc. If an abscess forms the pain will vanish on the natural or surgical evacuation of the contained pus. Exceptionally, there is associated constipation, tympanites, abnormal tenderness, etc. Both testicles may be attacked, and the vas deferens and seminal vesicles are frequently simultaneously involved. Permanent atrophy may follow, though a simple loss of consistency is more common. It is pronounced immediately after the acute disease, but in time it disappears, and the parts resume their normal condition and tone. When acute orchitis accompanies mumps, it usually involves only one testicle; it may precede the invasion of the parotid gland or be the only physical evidence of the disease. Acute parotiditis is complicated in about 5 per cent. by acute orchitis. When acute orchitis is a sequel of tonsilitis, it has about the same clinical history as when due to mumps. The typhoid variety is rarely severe; it may develop during the convalescent period of typhoid fever; it occurs most frequently in patients under four-

teen years of age. Orchi-epididymitis has usually a duration of about fourteen days, and terminates in recovery, atrophy, abscess, or gangrene.

Treatment.—Consists of rest in bed, suspension of the parts, and the daily painting of the scrotum with a mixture of Guaiacol and Glycerine, one to three, or the application of one of the following: Hot flaxseed poultices, hot fomentations, Lead and Opium stupes, a stimulating application composed of Ammonium chloride, two drachms. and Spirits vini recti, two ounces; together with the general treatment advised for acute epididymo-orchitis. Cracked ice applied by means of rubber bags is often very beneficial. A spray of a hot 2 per cent. aqueous Carbolic acid solution applied for fifteen minutes daily, after which the scrotum is wrapped in cotton and supported in a suspensory bandage, is highly recommended. The spray must not be continued longer than fifteen minutes, as it excoriates the skin. If these means fail to relieve the pain, subcutaneous division of the tunica albuginea will be necessary. Aconite, Belladonna, Gelsemium, Hamamelis, or Pulsatilla generally cover the totality of the symptoms. (See symptomatic indications under epididymo-orchitis.) Quinine is called for when the disease is of malarial origin.

Chronic Orchitis (Orchi-Epididymitis).—Etiology.—This disorder may follow traumatism, exposure to cold, excessive venery or be due to a strumous, gouty, rheumatic, or a malarial condition of the system, or the debility of old age; it sometimes occurs in children.

Clinical History.—As the lesion develops, the testicle becomes swollen, ovoid in form, hard, tense and sensitive, and the scrotum red, inflamed and œdematous. Examination and manipulation of the inflamed and swollen organs is sometimes so exquisitely painful as to cause faintness, if not complete syncope. Sometimes pain referred to the lumbar region is the only subjective symptom; usually, however, the pain in the

testicle is agonizing, and out of all proportion to the amount of swelling, being due to the distension of the firm and unyielding tunica albuginea. It may be continuous, disappear gradually or stop suddenly. The sudden cessation of the pain may indicate gangrene or death of the part, and will be accompanied by a chill and rapid swelling. When pus forms it may burrow its way to the surface and point, when it should be evacuated ; if it occurs in the centre of the organ it may become encapsulated.

Recovery without atrophy generally occurs, though the testicle may undergo degeneration, terminating in an abscess with sinuses, fungus outgrowths, etc., necessitating the removal of the organ. Chronic malarial orchio-epididymitis is characterized by its paroxysmal exacerbations and the periodicity of the attacks of pain. Gouty orchitis may alternate with gouty conditions elsewhere. Relapses as well as sudden seizures are common. This condition may migrate from one testicle to the other without apparent reason.

Treatment.—The pain often necessitates rest in bed and suspension of the testicles by a sling or suspensory bandage, and the application of Guaiacol and Glycerine, one to three, hot tobacco and flaxseed poultices, etc. If these means do not ameliorate the distress, the puncture of the tunica albuginea with a sharp-pointed, narrow bistoury under proper antiseptic precautions may be necessary. If an abscess forms it must be opened by free incision and the pus cavity cleansed with a hot 50 per cent. solution of Hydrogen peroxide, followed by a warm 50 per cent. solution of Electrozone, drainage instituted and the parts wrapped in antiseptic gauze and properly supported. When the destruction of tissue has been extensive castration is usually necessary.

The totality of the symptoms presented often calls for Aurum, Clematis, Conium, Gelsemium, Hepar sulph., Hypericum, Kali iod., Mercurius sol., Pulsatilla or Rhus tox.

Tubercular Epididymo-Orchitis.—This condition is usually induced by hæmatogenic infection during the evolution of a general tuberculosis; it may be due to direct extension from a prostatic, vesical, seminal or renal tuberculosis; occasionally it develops primarily in the epididymis. It may be acute or chronic. On account of the more sluggish circulation, the left testicle is more frequently primarily involved than the right. The exciting cause of the acute variety is usually traumatism or urethral inflammation.

Clinical History.—The symptoms vary little from those of a mild epididymo-orchitis, unless there is an associated gonorrhœal invasion, when, after a seeming simple epididymitis, instead of resolution occurring in from ten to fourteen days, the swelling persists for a few weeks, and in subsiding, leaves nodular masses in the epididymis, or suppuration may follow. This form usually attacks debilitated young men, and usually their other genito-urinary organs soon become involved.

Acute primary tuberculosis of the epididymis commences insidiously; the organ swells somewhat uniformly, large, knobby masses developing at either end and often without apparent cause; the testicle becomes two or three times its normal size. The local lesion is generally preceded by a recurring, muco-purulent, turbid, urethral discharge, present only in the morning, which is generally due to a preceding tubercular spermato-cystitis or prostatitis, which is not influenced by local treatment. There is also increased frequency in the calls to micturate, hypersensitive condition of the deep urethra and an occasional terminal hæmaturia.

The chronic form is characterized by the slow, gradual and painless development of one or more tubercular nodules, generally on the globus major of the epididymis or in the testis; it may therefore go on for some time without being discovered. When bruised the nodules become tender. The tubercular mass is hard and may become sclerosed; the secreting

portion of the testicle may be dotted here and there with minute tubercular foci (Fig. 17), which, passing through the characteristic stages of tubercular inflammation, terminate in small abscesses. These may open into one another and form abscesses of considerable size. As the growths in the epididymis develop they become knotted and irregular in shape, and, though pus may be present, fluctuation cannot be demonstrated. These tubercular nodules may undergo cheesy degeneration, lime salts be deposited and the mass become sur-

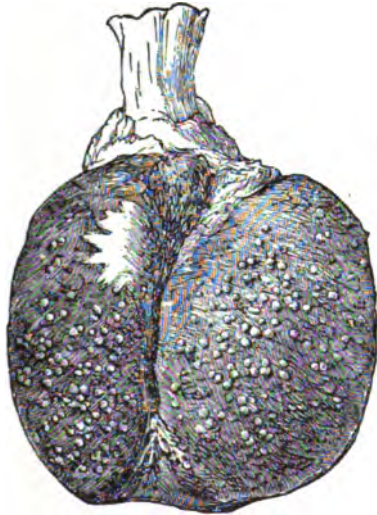


FIG. 17.—Miliary Tuberculosis of Testis. (St. Thomas' Hospital Museum.) (*Osborn.*)

rounded by a dense fibrous capsule and remain quiescent for an indefinite period, or the abscess may evacuate itself into the loose tissue of the scrotum and form a large, boggy tumor, which finally discharges externally. The vas deferens is usually simultaneously involved, and feels hard and knotted. Chronic tubercular involvement of the testicle is usually preceded by some urethral discharge, which is generally due to

an earlier tubercular spermato-cystitis or prostatitis. There is no accompanying lymphatic enlargement or increase in the size of the veins as occurs in cancer of these organs. Chronic tubercular epididymo-orchitis may be complicated by hydrocele due to tubercular involvement of the adjacent tunica vaginalis, though, as a rule, a complicating hydrocele is absent. Early in the disease the testicle loses its sensibility and does not give the usual sickening sensation when examined, even if handled roughly.

Prognosis.—In acute primary tuberculosis of the testicle complete recovery may occur or the deposit of tubercular material may become encapsulated and the condition become chronic. Sometimes a number of small abscesses develop which may coalesce and form one of moderate dimensions. This abscess may open into the tunica vaginalis and cause a pyocele, or burrow into the surrounding tissues and finally discharge externally. When it owes its evolution to a gonorrhœal epididymitis, resolution is imperfect and the condition terminates in chronic tubercular epididymitis or abscess.

In the chronic form the prognosis varies with the constitutional condition, the cause of the tubercular infection, the degree of local lesion, family history, etc.

Treatment.—Where a tubercular epididymo-orchitis is dependent upon a general systemic infection or a lesion in the urogenital tract, change of air with freedom from business and other cares, a nutritious diet and the indicated remedy may give relief.

In the very acute variety, the treatment advised for epididymo-orchitis will be useful, but in the less severe forms, protection of the parts by wrapping the scrotum in cotton with the support afforded by a well-fitting suspensory which allows the patient a limited degree of activity, will be most satisfactory. Tubercular patients are likely to do poorly if confined to bed. They should be well nourished and proper

attention given to the general hygiene and climate. Abscess formations may be opened, curretted, and the cavities packed daily with Iodoform gauze. Baryta carbonica, muriatica or iodata, Calcareo carbonica or acetica, or Iodoform have their reported cures.

In the chronic variety, hypodermatic injections of ten to ninety drops of a mixture composed of Iodoform and Glycerine, 1-10, or a 10 per cent. solution of Chloride of zinc, into the diseased area of the epididymis, and repeated every two weeks, have seemingly proved beneficial.

When the lesion is chronic and but one testicle is involved and there is no disease of the other organs, castration may be indicated.

Epididymectomy and removal of the diseased vas may give satisfactory results if the disease is confined to the epididymis. In this operative procedure the larger vessels are not disturbed. Rapid recovery may be expected, no nervous symptoms such as sometimes follow castration are observed and the masculine qualities are perfectly preserved. The operation is performed as follows: A small incision is made over the spermatic cord in the upper part of the scrotum, the testicle exposed by dissection and the epididymis carefully separated from the testis, care being taken not to incise the tunica albuginea. As much as possible of the diseased vas is removed and its open end closed with the cautery, and all bleeding points properly secured. A small drainage tube is then inserted in the lower part of the wound which is removed on the third day.* The scrotum is surgically closed. When there has been burrowing of pus or the testis is involved, castration and the removal of all diseased tissue will be necessary, the vas being denuded and removed as high as possible. Sometimes this operation must be followed by removal of the distal end of the vas with its connecting seminal vesicle. For the after-treatment, good hygiene and diet must

be observed, the ingestion of fat food being pushed to the point of tolerance, and the administration of *Tuberculinum*, *Silicea*, etc., should not be neglected.

Syphilitic Epididymitis.—This disorder occasionally appears during the early constitutional period of lues in the form of a nodule about the size of a bean in the head of the epididymis. The growth is not painful, often having no associated symptomatic manifestations and hence may be overlooked. Occasionally there is some inflammatory exudate into the surrounding fibrinous tissues, but, under the general treatment of the luetic disease the local lesion will disappear. In late syphilis the epididymis may become swollen, hard and nodular. As the exudation extends, the tunica vaginalis, especially the parietal layer near the epididymis, becomes thickened and infiltrated, forming a crust or ridge like an oyster shell; with this there is a varying degree of hydrocele, the contained fluid of which may be somewhat thickened. When appropriate, general treatment is not administered, foci of gummatous softening occur, followed by the discharge of the contents of the gummatous mass through the scrotal tissues.

Syphilitic Orchitis.—This is one of the many manifestations of late syphilis. It rarely appears before the end of the first year of the disease. The testes, due to general interstitial infiltration, become insidiously, painlessly and uniformly enlarged, hard and insensible. The epididymis may be stretched out over the testis or it may be simultaneously involved. This holds true concerning an associated hydrocele.

If the condition is neglected, the long-standing pressure may destroy the secreting portion of the testes gradually terminating in absorption and atrophy. If a gummatous condition occurs, the circumscribed area of the growth may soften and destroy the inclosing tunica albuginea, the pus making its way through the adherent over-lying scrotal tissue to fin-

ally discharge externally; the associated deep slough is slow in detaching itself. The resulting opening may close by granulation or leave a mass from which protrudes what is known as a fungus testis. After proper anti-syphilitic treatment, if healing does not occur, curettment or removal of the fungoid mass may be advisable. Calomel or Ungentum hydrargyri as local applications are sometimes sufficient.

Fungus Testis.—This benign spongy growth of the testicle is made up of granulation tissue containing seminiferous tubules, the natural sequence of degeneration of the abscess walls due to true orchitis, syphilis, tuberculosis, etc. It presents a pale red, easily bleeding, granulating surface, the manipulation of which gives a peculiar sickening feeling, as experienced when pressure is applied to the normal testicle.

Treatment. — Pressure and caustics are often efficacious. The edges of the tunica albuginea can be scarified, brought together by sutures over the hernia and dressed antiseptically, or the growth can be curetted and the wound packed with iodoform gauze. If it does not yield readily to treatment, castration may be required. The tubercular variety should be curetted, touched with caustic potash, and packed with iodoform gauze. The syphilitic, in addition to the local treatment already outlined, will require the administration of the proper anti-syphilitic remedies.

TUMORS OF THE TESTICLE.

Growths of the testicle may be malignant or benign. Often the two conditions are associated in the same organ.

Malignant Tumors of the Testicle.—Cancerous disease of the testicle may follow as a sequel of traumatism, gonorrhœal or syphilitic epididymo-orchitis, etc., though it is generally of hæmatogenic origin. It is especially likely to occur when the testicle is misplaced. The growth may present itself as any of the different forms of cancer, though it is usually of

the medullary or scirrhus variety, the former being the most common. Epithelioma, secondary to similar lesions of the penis or scrotum sometimes occurs. Cancer of the testicle may develop at any time of life. It is the location of primary selection of two and eight-tenths of all malignant growths. The medullary form is more common in the young, occurring



FIG. 18.—Cancer of the Right Testicle. (Monod and Terrilon.)

even in infancy, and is most frequent from puberty to the thirtieth year. It may be either primary or due to the transformation of a sarcoma. The hard variety (scirrhus) is usually secondary to a general carcinomatous involvement; it can often be traced to some traumatism. The growth progresses slowly,

though sometimes it seems rapid, the tumor being smooth and tense from the general swelling and effusion into the tunica vaginalis. At first it is ovoid, elastic or semi-fluctuating, but as time goes on it becomes uneven and irregular in contour (Fig. 18). The tumor may attain large size. The swelling, though rapid, is often without special pain, but when the cord and contiguous lymphatics become involved it is usually severe, being cutting and lancinating in character. Reflex pains in the groin, back, and down the thighs are early symptoms. Testicular pain disappears early. The walls of the scrotum and the cancerous mass finally become adherent, and breaking down in spots, open and give rise to malignant fungoid growths with a bloody ichorous discharge. The associated abdominal, pelvic and inguinal glands become enlarged and infiltrated with cancerous material. The veins of the scrotum become prominent and swollen and the legs œdematous. Later on, the growth increases rapidly and is accompanied by sharp shooting and burning pains. The diagnosis should always be confirmed by a microscopic examination of the growth. Death finally results from the discharges, hæmorrhages, pain and general sepsis.

Diagnosis.—A malignant involvement should always be suspected when a rapid and progressive new growth develops in the testicle without apparent cause, especially if accompanied by marked dilatation of the blood-vessels of the cord and scrotum, with involvement of the lymphatic glands; these, with the later developing cachexia, make a picture not easily misunderstood. When it follows traumatism, the progressive increase in size is characteristic. A syphilitic gumma never grows larger than a good-sized apple. The clinical history will be of great assistance in differential diagnosis. The neighboring genito-urinary organs, as a rule, become involved ultimately by direct infection from migrating cancer cells.

**KEYES' DIAGNOSTIC TABLE OF THE MOST IMPORTANT
NEOPLASMS OF THE TESTIS.**

TUBERCULAR TESTIS.	SYPHILITIC TESTIS.	CANCER.	SARCOMA.
1. Most common in early youth and manhood.	1. Most common in middle or later life.	1. Most common in youth.	1. Most common in early manhood.
2. No change in scrotal veins.	2. Same.	2. Scrotal vein becomes enlarged and varicose from pressure of cancerous glands above.	2. No change.
3. Does not grow to great size.	3. Comparatively small.	3. May reach an immense size.	3. May become very large.
4. Holds second place in frequency.	4. Most common of the four.	4. Holds third place.	4. Least common.
5. Primarily affects epididymis.	5. Primarily affects body of testis.	5. Same.	5. Same.
6. Form knotty, irregular, hard, especially the epididymis.	6. May be perfectly smooth and oval, or more or less lumpy.	6. Uneven; prominent, hard and soft spots; indefinite fluctuation.	6. Slightly uneven, oval, perhaps with points of fluctuation,
7. Development slow.	7. Same.	7. Development rapid.	7. Very slow, often suddenly becoming rapid.
8. Pain absent, or insignificant.	8. Often absolutely no pain.	8. Pain liable to be severe soon after commencement; sometimes excruciating.	8. No pain.
9. Often discovered by accident.	9. Same.	9. Recognized by pains from the start.	9. Tumor grows rapidly and is usually discovered when small.
10. Usually no sensation on pressure, neither pain nor normal sensation.	10. Same.	10. Darting, sharp, burning paroxysms and constant pains, aggravated by handling.	10. No pain; squeezing testicle often produces a feeling of faintness.
11. Fluid in tunica vaginalis sometimes.	11. Fluid in tunica vaginalis nearly always.	11. Fluid in tunica vaginalis usually slight.	11. Fluid in tunica vaginalis rarely.
12. Tendency to suppurate, discharge, and leave fistula.	12. Tendency to atrophy without external opening; sometimes there is a discharge and fungus.	12. Tendency to open and form fungus hæmatodes.	12. No tendency to open or to form fungus.
13. Both testes often consecutively attacked.	13. Same.	13. Usually only one testicle suffers.	13. Same.

KEYES' DIAGNOSTIC TABLE OF THE MOST IMPORTANT
NEOPLASMS OF THE TESTIS.

(Continued.)

TUBERCULAR TESTIS.	SYPHILITIC TESTIS.	CANCER.	SARCOMA.
14. Loss or impairment of sexual desire and power when both glands are involved.	14. Same, and more marked; sometimes exists when one gland only is diseased.	14. Both glands not involved simultaneously; hence not at first necessarily impaired.	14. Same.
15. Fungus not very common. If found is pale and soft, bleeding rather easily, composed mainly of granulations, pus thin, sinuses leading into testicles; growth slow, usually painless.	15. Fungus very rare. If found it is hard, yellow, mainly composed of tubes and yellow syphilitic matter; does not bleed very easily; no sinuses; growth slow and painless.	15. Fungus constant if testis remains long enough; grows rapidly, bleeds profusely, sloughs readily; is covered with sanious, badly-smelling ichor; is formed mainly of cancer tissue; is very painful.	15. No fungus.
16. No glandular enlargement.	16. Same.	16. Inguinal and pelvic glands involved.	16. Glands sometimes involved.
17. Very rebellious to medical treatment.	17. If taken early, quickly amenable to treatment. Many cases always reducible in size by intelligent treatment, to which all doubtful cases should be subjected.	17. Treatment ineffectual. If cut out, returns elsewhere.	17. Medical treatment ineffective. If cut out does not necessarily reappear. If left cancerous degeneration may occur.
18. Cord always affected eventually.	18. Cord is never involved.	18. Cord affected in advanced disease.	18. Cord never affected.
19. Vesicular seminales liable to be involved.	19. Nothing of the sort.	19. Nothing.	19. Nothing.
20. Lumpy to feel.	20. Excessively hard.	20. Hard and soft in alternate spots.	20. Elastic.
21. Duration several years.	21. Duration several years, usually less than tubercle.	21. Duration average two years.	21. Duration many years (?).
22. Prognosis not favorable. Progress always indolent, entire cure rare.	22. Prognosis good, with functions restored if treated; atrophies if not treated.	22. Prognosis bad; kills by cachexia or hæmorrhage if not removed, by return elsewhere if extirpated.	22. Prognosis good; does not return if removed (?). If left, liable to become cancerous.

Treatment.—In the early stage, Arsenicum or Conium may prove useful. Castration, however, is usually not only necessary, but should be advised as soon as a positive diagnosis is made, though the disease generally returns in some part of the genito-urinary tract after the operation.

Sarcoma of the Testicle.—Sarcoma may develop as small-celled medullary tumors, with very little intercellular substance, or as firm, fleshy tumors composed of mixed cells with a fibrous sarcoma (fibro-sarcomata). When the matrix is elastic, mucous or granular, they are called myxo- or granulo-sarcomata. Sarcomata commence in the connective tissue between the tubules. In growth they act like carcinomata, but usually attack the testicle bilaterally. Myo-sarcomata occur frequently in the testicles of children between birth and puberty. The true sarcoma is very rare. When present it generally becomes transformed into the encephaloid, sometimes at such an early period that the change is not discovered. The growth invades primarily the testis, and finally the epididymis, forming a smooth, homogeneous mass developing sometimes to an enormous size. It may remain quiescent for a long period and then suddenly increase in growth and malignancy without seeming cause.

Treatment.—Castration.

Tumors of the Testicle, whether benign or malignant, are characterized by their mixed elements, the myxomatous, sarcomatous and cartilaginous blending in a single new growth, the latter often complicating the first even when least expected.

Lympho-Sarcomata develop in children and young men, and are characterized by their rapid growth and the tendency to the formation of secondary growths in other parts of the body.

Enchondromata develop from the interstitial connective tissue, appearing generally between the thirtieth and

fortieth years, as hard, slowly-growing masses, without any other symptom except a feeling of weight. After a time, however, they increase rapidly, soften and fluctuate on palpation. They may be simple or mixed in character, the former being dense and hard and remaining so, while the latter often soften. They are generally malignant and should be removed at once.

Fibromata of the Testicle are extremely rare. The diagnosis depends upon the hardness of the tumor, non-involvement of the cord and epididymis, slowness of development and the presence of testicular sensation. They should be excised.



FIG. 19.—Cystic Disease of the Testicle. (Morris.)

Myxomata, Osteomata and Myomata of the Testicle have been reported but their special history and character have not been formulated.

Cysts of the Testicle frequently occur, either alone or associated with some other disease; they vary in size from a millet seed to an egg (Fig. 19). Pain is usually absent. When of large size they may fluctuate on palpation. They are sometimes mistaken for hydrocele or hæmatocele.

Treatment.—When they become large or troublesome, inflamed or suppurating, they can be dissected off; if located within the testicle itself castration may be necessary.

Cystomata of the Testicle.—These growths include the cysto-fibromata and cysto-sarcomata, the latter being malig-

nant. They may develop at any age, from birth to advanced life. They rarely cause pain. The benign form grows slowly and rarely attains the size of a lemon. One removed by the author was four inches in diameter. The growth is tense, smooth and ovoid in contour. After it has attained considerable size, palpation may detect spots which seem soft and less resistant. The contents may be mucoid, clear or like coffee grounds; sometimes it contains intra-cystic cauliflower-like growths. The spermatic cord and lymphatics are not involved, and the general health is not impaired. The malignant variety grow more rapidly, are more elastic to touch, and often become uneven or bosselated. The prognosis is always uncertain.

Treatment.—Castration.

Dermoid Cysts of the Testicle may be located entirely within the testicle, or at the junction of the testis and the epididymis. Their origin is uncertain. They are always congenital, commonly appearing during the first few months of infancy, remaining quiescent for twenty to forty years, when they again grow rapidly, suppurate and discharge. They contain hair, teeth, bone, sebaceous material, etc. Incision and evacuation may be successful in removing them, though castration is often required.

Abscess of the Testicle.—Any acute or chronic inflammation of the testicle or epididymis may terminate in a circumscribed collection of pus. It may occur as a sequel of tubercular, malignant or syphilitic disease, but it happens most frequently in the swollen testicle excited by instrumentation. Occasionally it is a complication of an acute infectious disease. The testicle rapidly increases in size and the accompanying pain is often severe. A chill generally announces the appearance of pus. The enveloping scrotal tissues become inflamed and adherent, and, within a short period, fluctuation can readily be demonstrated unless the pus cavity is small and

deeply located. Circumscribed collections of pus in the testicle may undergo caseous degeneration and become encysted; they may burrow and cause sloughing of the entire gland, rupture into the tunica vaginalis, or open on the surface of the scrotum by one or more sinuous openings, which may slowly close or remain open for years.

Treatment.—When the abscess is small it should be opened, the cavity thoroughly irrigated, curetted, if necessary, and packed with Iodoform gauze. When there are numerous abscesses or sloughing has taken place, castration will ultimately give better results. Hepar sulphur, Hecla lava or Echinacea are sometimes abortive.

Castration.—Special attention must be given to the surgical preparation of the parts; the lime and soda wash must never be omitted. On account of the sensitive condition of the skin of the scrotum, if a soap poultice is used, it must not be employed for more than three hours. When the parts have been made aseptic, the penis being inclosed in a sterile bandage, the testicle, if movable, is pushed high into the scrotum and the scrotal tissues made tense over it. An incision, sufficient in length to allow of the exit of the testicle, is made through the scrotal tissues and the testicle exposed. When the testicle with its loose covering is reached the organ should be pushed out. After incising the remains of the gubernaculum, which runs from the testicle to the bottom of the scrotum, the surrounding tissue is dissected off, with the exception of the vas deferens and the pampiniform plexus, which are allowed to remain. The latter may be tied with strong catgut, the spermatic artery by a threaded ligature, and the vas with catgut and sealed with the cautery, or the cord may be ligated in two or more sections. If the castration has been for a cancerous or tubercular disease, the cord must be removed at the highest possible point; if necessary, the inguinal canal may be opened and the vas followed by stripping back the per-

itoneum to the seminal vesicles. When there is any possibility of a recurrence of the disease in the stump of the vas it must be tied with an absorbable ligature and fixed near the skin incision, which avoids burrowing sinuses in case of a return of the disease.

When the testicle is much diseased, an incision, extending from the external abdominal ring along the anterior aspect of the scrotum over and down to the testicular mass, should be made and the latter dissected out. Bleeding from the scrotal tissues must always be controlled, all redundant scrotal tissues removed, the edges of the wound properly approximated with silk or silk-worm gut sutures, and the whole dressed antiseptically. Where infection has probably occurred, a drainage tube should be secured in the lower angle of the wound, which should be removed on the second day. The mortality is small in the young and middle-aged, but much greater in those enfeebled by old age or disease. When both testicles, which are free from disease, are removed a varying degree of mental aberration often follows. The replacing of the testicle by a celluloid substitute for cosmetic effect has been successfully accomplished.

If by accident or design a boy is castrated before puberty, a morally and physically weak, cowardly youth, lacking in all the finer feelings of humanity, with a willingness to afflict by direction the most severe and unnatural punishments, results. The adult eunuch is taller than the average man, but has less physical power. His chest is narrow, his hips broad, with a tendency to being knock-kneed. His voice is shrill and falsetto and about an octave above the male register. His face is characteristic, the skin being dark, thin and wrinkled, giving the impression of premature age. The face and pubes are almost devoid of hair, the penis undeveloped and shrunken. Emasculation engenders a diminished virile force, both mental and physical, with slothfulness and indifference.

SCROTAL HYDROCELE.

A scrotal hydrocele may be either an accumulation of serous or sero-fibrinous fluid within the tunica vaginalis, or a cyst connected with the testicle or some part of the spermatic cord. It may be acute, chronic, congenital, acquired, encysted, diffuse, etc.

Acute Scrotal Hydrocele.—This condition is a simple inflammatory, sero-plastic exudation into the tunica vaginalis; it accompanies to a varying degree all inflammatory conditions of the testicle or epididymis, particularly gonorrhœal epididymo-orchitis and sometimes the syphilitic and tubercular varieties. It may be caused by traumatism or irritating injections.

Clinical History.—This varies greatly with the exciting cause, which generally occasions the special symptom. Pain is sometimes very severe. When the fluid in the tunica vaginalis accumulates rapidly it indicates a high grade of inflammatory, disease of the testicle or suppuration. It is accompanied by heat, redness and scrotal œdema. Generally, there are no other local or constitutional symptoms. The presence of fluid may be demonstrated by transmitted light, by fluctuation or the aspirating needle.

Treatment.—The patient should be put to bed and the cause sought. If the pain is severe immediate aspiration of the fluid may be necessary to relieve the tension, and it may have to be repeated a number of times before a cure results. Apis, Cantharis or Helleborus may cause absorption. If the fluid persists for eight or more weeks the treatment as laid down for chronic hydrocele will be required.

Chronic Scrotal Hydrocele.—**Etiology.**—It may be caused by anything which disturbs the balance between secretion and absorption within the tunica vaginalis. It may be secondary to some pathological lesion of the epididymis, testicle or cord.

It may be induced by mechanical irritation, such as horseback riding, tight trousers, etc.; by the presence of loose, cartilaginous bodies in the tunica vaginalis which irritate and cause over-secretion; by interference with the return circulation, due to an ill-fitting hernial truss; by the presence of the *filaria sanguinis hominis*, as well as by renal or hepatic disease. It may be the sequel of an acute hydrocele. Not infrequently it seems to be idiopathic. It may develop at any period of

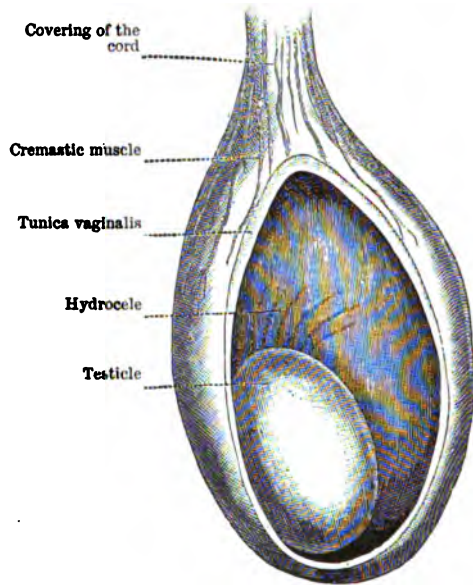


FIG. 20.—Hydrocele of Tunica Vaginalis. (Sutton.)

life, but occurs most frequently between the twentieth and fiftieth years. In the tropics one man in every ten is in some degree thus afflicted.

Pathological Anatomy.—This disorder signifies an effusion into and the presence in the tunica vaginalis (Fig. 20) of an albuminous fluid, neutral or slightly alkaline in reaction, with a specific gravity of about 1022. This fluid is light

amber, or straw-colored, red, brown, chocolate or black from the admixture of blood, it varies in consistency from a thin liquid to a jelly-like substance, and contains fibrinogen, albumin, paraglobulin, cholesterine plates, epithelium, fatty particles and sometimes spermatozoa and leucocytes. Often, following careless unaseptic puncture, it becomes contaminated with bacteria.

The sac of the hydrocele or distended walls of the tunica vaginalis often present no evidence of inflammation or thickening. Generally from slight bruising of the tumor it becomes thickened and leathery, the inner surface of the tunica vaginalis loses its lustre and has a wrinkled and irregular appearance, sometimes being covered with a warty-like growth. Adhesions from fibrous inflammation and calcification of the walls of the tunica vaginalis have occurred. Fibrous bodies of various sizes having no attachments are occasionally present in the hydrocele cavity. They are due to a deposit of the salts of the hydrocele fluid upon some warty mass which finally breaks free from its attachment and becomes covered with fibrin. Misplacement of the testicle from adhesion and contraction is often observed. Hydrocele may induce atrophy and sclerosis of the testes and epididymi.

Clinical History.—The quantity of fluid varies from a few drachms to one hundred or more ounces, accumulates slowly, generally without pain, and causes so little inconvenience that it may not be noticed before the scrotum has attained a considerable size, though a dragging sensation is occasionally felt. Hydrocele dependent upon disease of the testes or epididymi is generally smaller than that due to general conditions. The swelling appears at the most dependent portion of the scrotum and gradually increases until it becomes pear-shaped (Fig. 21); if very large, it may be spherical and the penis may be practically hidden. The spermatic cord of natural size can easily be made out above the swelling. If old

adhesions exist in the tunica vaginalis, the swelling will be irregular and distinct points of fluctuation can be demonstrated. The scrotal hydrocele is tense, cannot be compressed, is light in weight compared to its size, and is not sensitive. The cutaneous layer of the scrotum, which is drawn somewhat tightly over the distended tunica vaginalis, is movable and usually free from redness and heat. When the tumor is pressed back between the legs, if the pressure is removed, it will return to its original position. The location of the testicle is recognized by the sickening feeling produced



FIG. 21.—Hydrocele. (Keen and White.)

when the tumor at that point is squeezed. Sometimes it is inverted and is located in front and below the centre, but it is usually found a little below the centre in the posterior part of the fluid. This is of importance and must be considered to avoid possible injury to the organ when the aspirating needle or trocar and canula are used to evacuate the fluid in the sac. A transmission wave can generally be distinctly felt, but this may be unachievable when there is only a small amount of fluid present or when the cavity is over-distended and tense from its accumulation. Cough impulse is always absent.

The presence of fluid may be confirmed by the test of translucency, if the walls of the tunica vaginalis have not been thickened by the deposit of plastic material or cartilaginous and calcified plates, which sometimes form in the walls of the the sac in old hydroceles, or the contained fluid darkened by blood, cholesterine, fat, etc. This test is a most satisfactory one when the effusion has been slow, the walls thin and white, and the fluid clear, free from blood, pus, etc. To apply the test, the room must be darkened and a candle or an electric light held in a small shallow cup, placed behind the suspected swelling, which is made tense, the surgeon standing on the opposite side, either shading the eyes with the hand or looking through a short tube, the end of which is placed against the wall of the swollen scrotum. If it is hydrocele, the whole mass will look clear and translucent, except where it is darkened by the outline of the testicle.

Treatment.—In infants, scrotal hydrocele has disappeared after painting the scrotum with a weak solution of the tincture of Iodine, Collodion, Ammonium muriaticum, ten grains to the ounce of water, or with a 3 per cent. aqueous solution of Ichthyol. Acupuncture is sometimes successful. The usual palliative treatment is support of the scrotal tumor by a well-fitting suspensory bandage, and, when required, evacuation of the contents of the sac with the trocar and canula or the aspirator. It is called tapping of a hydrocele, and is performed as follows: The scrotum being surgically prepared, and hernia and other tumors of the scrotum excluded, and the testicle located, it being, as a rule, at the lower third and posterior part of the sac; the scrotal enlargement is grasped firmly with the left hand, the instrument with the right, and the aspirating needle or trocar and canula plunged into the sac obliquely upward and backward from the middle and front of the hydrocele so as to avoid injuring the testicle. Should this happen it will cause some pain and a small quantity of blood may

flow from the canula; generally it is unimportant, though the scrotum should immediately be strapped to prevent further effusion of blood. When the trocar is removed the contents of the sac will escape through the canula. The canula must fit the trocar closely, otherwise it may push the tense tunica vaginalis before it and render the operation unsuccessful. In removing the canula the finger should be kept over its distal end to prevent leaking of the contained fluid into the areolar tissue. On removal of the instrument the point of entrance should be closed with a small piece of cotton and Iodoform collodion. Sometimes the sac does not refill, a reactive or adhesive inflammation setting in, which closes the tunica vaginalis; usually, however, the fluid returns, at first rapidly, then more slowly, consuming from three months to a year in regaining its original quantity. When a hydrocele is estimated to contain over sixteen ounces of fluid, the entire quantity should not be evacuated at the first tapping; removal of the balance can be effected at a second operation, a few days later. This minimizes the tendency to rapid refilling of the sac and the danger of hæmatocele from the sudden removal of pressure upon the bloodvessels. Hæmatocele may also result from the puncture of a small bloodvessel. If simple tapping does not cure, or its employment as a palliative is deemed ill-advised, evacuation of the fluid, followed by the immediate introduction into the cavity of Carbolic acid, Tincture of iodine, Port wine, a strong solution of Alum, Lime water, Quercus alba or Alcohol, etc., must be considered. When the walls of the hydrocele are not thickened to any great extent, the fluid contents translucent, not over eight ounces in volume, and the testicle is free from disease except slight thickening of the epididymis, Carbolic acid is almost universally employed to produce irritation of the internal wall of the tunica vaginalis, with subsequent adhesive inflammation and ultimate obliteration of the sac. It usually causes no pain and is not

followed by systemic poisoning. The Carbolic acid crystals are liquified by heat. The sac usually refills rapidly, but the fluid is generally re-absorbed in two or three weeks; if this absorption is slow, it may be well to evacuate this fluid in order to allow the plastic material on the walls of the sac to come in contact and unite. Sometimes the pain and swelling following the operation are severe and may require the application of hot stupes or poultices for a day or two, and the administration of an anodyne. Before evacuation of the hydrocele a hypodermic syringe of the capacity of one hundred minims should be filled with the requisite amount (twenty to one hundred drops) of Carbolic acid. Its needle, about two inches in length, should be plunged through the scrotal wall at right angles to the scrotum, and given in charge of a competent assistant, who must not allow its point to be withdrawn from the hydrocele cavity. A little vaseline should be smeared around the needle to prevent burning of the scrotal tissues by the Carbolic acid in case any part of it escapes. The fluid contents of the sac should then be entirely evacuated with the trocar and canula or aspirator, the hypodermic syringe properly attached to the needle, and the Carbolic acid solution injected into the sac, the needle removed and the acid thoroughly applied to the entire inner surface of the sac by gentle manipulation of the scrotum. The parts should be enveloped in gauze and properly supported. If the reaction is not severe, a suspensory bandage may be adjusted and the patient be able to attend to business by the second or third day. When the hydrocele contains a pint or more of fluid, a number of tapings, to reduce its size gradually, must precede this method of treatment.

Incision of the sac and drainage is sometimes substituted for the former operation. A free vertical incision from one to two inches in length is made through the most dependent portion of the tumefaction, with a similar incision at the

upper anterior portion of the sac. After evacuation of the fluid, the cavity should be irrigated with a hot solution of Bichloride of mercury, 1-4000, and either loosely packed with sterile gauze, to be changed daily, or a drainage tube may be inserted, held in place by a safety pin at each end, to allow of proper irrigation and drainage, and surgically dressed with proper support. The tube should not be removed until the cavity is almost closed by granulation.

When the walls of the hydrocele are thickened and calcareous, the fluid contents bloody or purulent, there is a question as to the pathological condition present in the testes, epididymis or cord, there is a possibility of a complicating hernia or the injection method has been unsuccessful, incision of the sac (Volkmann's operation) with removal of a portion or the whole of the parietal wall of the tunica vaginalis (von Bergmann's method) are preferable. In the Volkmann operation the vertical incision should be carried along the entire anterior long axis of the tumor through the scrotal tissues to the tunica vaginalis, which is opened with the bistoury and scissors, its contents evacuated and the cavity irrigated with a hot saline or antiseptic solution. In the von Bergmann method the scrotal tissues are separated from the tense tunica vaginalis before the sac is opened. If the thickening is only inflammatory in nature, enough of the parietal layer may be left to cover the testicle; if it is fibrinous or cartilaginous it must be entirely removed, the bleeding points in the scrotum secured and the central portions of the wound brought together by catgut sutures. A drainage tube should be placed in both ends of the cavity and the parts surgically dressed. Volkmann applies Carbolic acid to the sac, sutures the edge of the tunica vaginalis to the skin and packs the cavity with Iodoform gauze, dressing it daily or as often as required until the cavity is filled with granulations. The objection to this method is the long period necessary for the wound to close by

granulation. Ferguson denudes the parietal layer covering the testicle in spaces of about one-quarter of an inch in diameter (he calls it quilting), scarifies the glandular layer, closes the tunica vaginalis and skin with catgut, and drains for three days by means of a few strands of silk-worm gut. In all the open methods of treatment great care must be observed to prevent infiltration and infection from urine, fæces, etc.

Eversion of the Sac.—This method of cure has been employed to advantage. The hydrocele is opened as in the von Bergmann operation and all of the parietal wall of the tunica vaginalis is removed; the testicle is then lifted from its scrotal bed, the tunica turned inside out and so held by a few interrupted catgut sutures; the testicle is then returned to its scrotal place and the wound closed without drainage.

After any one of these operative procedures, rest in bed is necessary until reaction and possible fever have disappeared. A suspensory bandage must be worn for a few weeks. Setons have been used, but are now obsolete. Electricity has some reported cures.

Hydrocele due to malignant or tubercular disease of the testicle is best treated by removal of the diseased area, though palliative or injection methods of treatment may be necessary for immediate relief. When due to leutic disease, the specific treatment will be all sufficient. The administration of Aurum, Graphites, Iodum, Kali iod., Pulsatilla, Rhododendron and Spongia, on their symptomatic indications, have cured without surgical treatment.

Congenital Hydrocele.—This disease is frequently met with in childhood and occasionally in adults. It is the result of imperfect obliteration of the communication between the peritoneum and its prolongation, known as the tunica vaginalis; consequently, any fluid which may accumulate in the peritoneal cavity may readily flow through this opening into the scrotal sac and give rise to symptoms easily mistaken for

hernia; it is sometimes associated with hernia. It may be caused by oversecretion of the tunica vaginalis.

Congenital hydrocele appears or is noticed soon after birth; the sac has no well-defined upper border, but is continuous with the inguinal canal. The tumor can be readily reduced, its fluid contents made to return slowly into the peritoneal cavity by placing the patient in the dorsal position and elevating the scrotum; it does not, however, give the gurgling sound which is heard on reducing a hernia. At night in bed it often disappears, but even if moderate pressure is applied to the inguinal ring, on assuming the upright position the fluid quickly returns. Cough impulse is present and the tumor gives flatness on percussion. When the sac is distended with fluid the testicle cannot easily be located, but when the contents have been emptied into the peritoneum the testicle will be found in its proper position.

Treatment.—A proper truss should be applied, with the administration of remedies as indicated by the general condition. When unsuccessful, incision with drainage by means of a small tube or a few strands of catgut will be necessary, the dressing being completed by enveloping the parts with an abundance of antiseptic gauze, protected from contamination from urine and feces by gutta-percha tissue, and kept in place by a proper bandage. The removal of the fluid through a canula and the introduction of a small piece of sterile catgut, which is allowed to remain in the cavity, has sometimes been very satisfactory. When the diagnosis is doubtful, a free incision into the sac will be necessary. The injection method is always contra-indicated.

Encysted Hydrocele of the Testicle.—Cysts of the epididymis occur in two-thirds of all men over forty years of age, and are clinically unimportant. The small serous cysts, vary in size from a pin-head to a pea, originate external to the epididymis and project from the convex free surface of the

head or the body near the tail ; they rarely contain spermatozoa. The larger cysts originate within the tissues of the epididymis and may contain two or three ounces of fluid with some spermatozoa (spermatocele). When connected with the testicle they are of small size, contain a serous, opaque, limpid, milky fluid, and an occasional spermatozoön ; they are located between the tunica albuginea and the tunica vaginalis, and usually develop slowly without symptoms. The acute variety develops rapidly and may become painful. These cysts have been mistaken for supernumerary testicles or tubercular growths.

Treatment.—The fluid should be evacuated and a few drops of liquified Carbolic acid crystals injected, or the sac extirpated.

Bilocular and Multilocular Hydrocele.—In the former, the hydrocele cavities are connected by one or more minute openings, one cavity being situated in the scrotum and the other in the abdominal cavity. The multilocular hydrocele may be congenital or the result of inflammatory adhesion. These sacs are located in the scrotum. The cavities often communicate, hence operative relief by tapping may be sometimes only partially successful. Both varieties usually present an irregular outline.

Hydrocele of the Cord.—It may be acute or chronic, diffuse or encysted. When acute, strain or traumatism is the usual cause. It is sometimes of rheumatic origin. When diffuse, it is generally induced by a phlebitis or some obstruction to the return circulation from the testicle. It occasions a swelling somewhat conical in form, the base of which is about on a level with the summit of the tunica vaginalis. The apex may extend up to or into the external ring. The outlines are often not sharply defined. The encysted variety may occur when a median portion of the peritoneal process connecting the tunica vaginalis and peritoneum fails to become

obliterated and one or many cysts result. If situated high up it may even extend into or through the inguinal ring.

Treatment.—The acute form is relieved by stupes and compresses of a hot aqueous solution of Boric acid, with elevation of the parts; the diffuse may require incision and drainage; the encysted, if single, should be operated as advised for chronic hydrocele; if multiple, incision and antiseptic dressing, with Arnica, Aconite or Apis mellifica as general remedies.

Infantile Hydrocele of the Cord.—This is designated as an effusion of a serous fluid into the unobliterated funicular portion of the tunica vaginalis, which is closed from the peritoneal cavity above, but communicates with the cavity of the tunica vaginalis below. The tumor may extend well up the cord. It may be bilocular. Treatment of the cavity is surgical, that given for chronic hydrocele being usually advisable. The bilocular form will require incision and removal of the sac.

Hernial Hydrocele signifies a serous effusion into the scrotal sac of an inguinal or scrotal hernia due to obliteration of the neck of the sac by adhesive inflammation or plugging of the sac by the intestines. The symptoms are those of hernia with the subsequent development of an associated translucent tumor. The sac should be excised and the radical operation for hernia performed.

Hæmatocele.—This term signifies an extravasation of blood into the tunica vaginalis, the sheath of the spermatic cord or any of the various structures of the scrotum, producing a swelling of varying size.

Acute Scrotal Hæmatocele.—The swelling generally appears suddenly, following traumatism or the giving way of a ligature, after a surgical operation upon the scrotum. The scrotum rapidly becomes very painful from the large and rapid extravasation of the blood, which may be bright red, but

is more often dark brown and mixed with pus. The scrotum itself becomes blue black or livid, and, if the swelling is great, the penis will be seemingly retracted. Acute hæmatocele has no tendency towards spontaneous recovery, and, if not relieved, will increase in size. If the extravasation is large or suppuration has resulted, fluctuation can be easily demonstrated. When a hæmatocele is a complication of a cyst or a hydrocele the original swelling becomes more tense and painful, with symptoms of shock, which may be followed by traumatic fever and suppuration.

Acute hæmatocele is differentiated from hydrocele by its history, sudden appearance, absence of translucency, and the general heavy feeling of the swollen scrotum.

Treatment.—Rest and elevation of the parts are imperative; cold applications, support of the scrotum, and incision of the scrotal tumor is often necessary to remove the extravasated blood from the tunica vaginalis and to properly secure the bleeding points, after which the cavity must be washed out with a hot, normal saline solution until the fluid comes away clear, when it should be surgically dressed. When the extravasation is moderate and confined to the scrotal tissues, evaporating lotions are often sufficient. Aconite should be administered if there is fever and shock; Arnica or Conium, if the result of traumatism; and, later, Sulphur Pulsatilla, Nux vomica, Hamamelis, etc.

Chronic Scrotal Hæmatocele.—This condition may follow a neglected acute hæmatocele, but it is generally dependent upon some disease of the tunica vaginalis or a hæmorrhagic diathesis, and appears between the fortieth and sixtieth year. In old hæmatocèles the fibrin of the blood adheres to the walls of the tunica vaginalis or cyst and gradually thickens and becomes organized. The tumefied mass in time becomes heavy, tense and hard. This condition sometimes leads to a diagnosis of malignant tumor or of some chronic enlargement of the

testicle, and operation for excision of the supposed growth has even been attempted. To confirm the diagnosis, the peculiar sensitiveness of the testicle to pressure should be utilized. The testicle, as in hydrocele, is usually located behind the tumor and about in the centre ; sometimes it is displaced and the sensitive point will be found elsewhere. The position of the testicle, if possible, should always be located before commencing an operation for removal of these products of exudation, as serious injury has followed neglect of this precaution, though in old cases the continued pressure, or original disease, may have obliterated all trace of the testicle.

Hæmatocele of the scrotum, like the hydrocele, is pyriform in shape, but not translucent; it has a heavy feel, with smooth bosselated surfaces, the contained fluid being red, chocolate or black and of varying consistency. The pain varies greatly and when of long standing it may scarcely be noticed. The general health usually remains good. Sometimes, even with the points already given, it is impossible to make a diagnosis without incision of the tumefaction or the use of the exploring trocar. Should clots close the opening of the trocar, or if inflammation is imminent from tension, incision will be necessary, but it should be performed only under the most rigid antiseptic methods.

Treatment.—After proper opening of the scrotal cavity the clots should be turned out and the pocket irrigated with a hot, normal, saline solution, or a dilute solution of Carbolic acid, the damaged and redundant parts removed, the vessels ligated, the edges of the wound and the tunica vaginalis united by a continuous suture and the cavity packed with Iodoform gauze, which should remain until separated by exudation. The wound should be dressed antiseptically until closed by granulations. In the aged, on account of the severe and rapid reaction, erysipelas and gangrene sometimes follow this operation, hence castration is often advisable. In the young and middle-

aged the operation is not only successful, but the parts are restored to usefulness. Happily, in many of the chronic cases, Sulphur, Iodine, Kali iod., etc., often produce satisfactory results.

Encysted Hæmatocele consists of an effusion of blood into an encysted hydrocele; it is of infrequent occurrence and should be treated on the same lines as hæmatocele.

Hæmatocele of the Cord indicates an effusion of blood into the spermatic cord. If general, it is called diffuse hæmatocele of the cord; if into a cyst, or when circumscribed, it is known as encysted hæmatocele of the cord. Both conditions are rare, and are only recognized by their clinical history. The treatment is the same as that advised for hæmatocele.

Intra-Testicular Hæmatocele.—This condition develops as the result of traumatism, and is followed by extravasation of blood into the parenchyma of the testicle, accompanied by severe and continued pain.

Treatment.—Rest, elevation of the parts and the continued application of cooling, evaporating lotions. If the condition is not relieved by these measures, aspiration through a large needle may be necessary to remove the fluid blood. If clots are present, an exploratory incision and their evacuation may be necessary. Aconite, Arnica, etc., should be given as indicated.

Chylocele.—This signifies an accumulation of chyle or fatty lymph in the tunica vaginalis. It is caused by a rupture of a lymph vessel in the tunica vaginalis; it may accompany a lymph scrotum or be due to a traumatism of a lymph vessel. A false variety is caused by fatty or cholesterin degeneration of the epithelium or fluid within a hydrocele cavity.

Foreign Bodies in the tunica vaginalis are sometimes present. They may prove to be cysts, fibroids, or be the result of inflammatory exudation, etc.

SECTION VI.

ANATOMY, ANOMALIES, INJURIES AND DISEASES OF THE SPERMATIC CORD.

Anatomy.—The spermatic cord is composed of the vas deferens, the habenula (the remains of the funicular process of the peritoneum) and certain vessels and veins, held together by connective tissue containing a few unstriped muscular fibres (the interstitial cremaster of Henle), all enclosed by the tunica vaginalis communis, which is continuous with the connective tissue adherent to the tunica vaginalis below, and above with the fascia transvasalis; external to this, in festooned layers, is the cremaster muscle, some of which dip below the testicle, all covered in by loose connective tissue and scrotal integument.

The vas deferens is the excretory duct of the testicle. It extends from the tail of the epididymis through the inguinal canal, curves downward and backward over the base of the bladder, crosses behind the ureters to the inner side of that duct and is separated from it by the seminal vesicle, where it terminates in a sacculated portion known as the ampullation of Henle. It has two muscular coats, the inner circular and the outer longitudinal; it is lined with columnar epithelium and surrounded by a dense fibrous coat. It is situated at the inner and posterior part of the spermatic cord. When examined in its scrotal position, between the fingers, it gives the feel as of a rigid tube when it escapes from the grasp. The pampiniform plexus of veins lies to the outer side of the cord. It is formed of the veins from the epididymis and tes-

tis. The larger of these veins have valves and they all unite at the top of the scrotum to form one large vessel, which on the left side empties into the renal vein and on the right into the ascending vena cava. There are three arteries—the spermatic from the aorta, the deferential from the superior vesical and the cremaster from the epigastric. The vessels and veins except the pampiniform plexus of veins somewhat surround the vas deferens. The spermatic plexus of nerves are derived from branches of the renal, aortic, superior mesenteric, hypogastric, and the lumbar plexus of the sympathetic. The genito-crural nerve supplies the cremaster and the inguinal branch of the ilio-inguinal.

ANOMALIES OF THE SPERMATIC CORD.

When the testicle is absent there is generally an associated non-appearance of the vas deferens.

TRAUMATISM OF THE SPERMATIC CORD.

Wounds of the cord are followed by profuse bleeding which is easily controlled by surgical methods. When possible, the vas deferens should be repaired by the Van Hook method of ureteral anastomosis.

DISEASES OF THE SPERMATIC CORD AND TESTIS.

Neuralgia of the Spermatic Cord.—Etiology.—It occurs with or without appreciable lesion of the testicle or cord, though it often accompanies atrophy or hypertrophy of the testicle, hydrocele, varicocele. It may be reflex from deep urethral, prostatic or bladder disease. It may be associated with nodular growths on the epididymis, and may accompany a nephritic colic. It is sometimes caused by the spasmodic contraction of the cremaster muscles (associated with vomiting, cold sweat, etc.); by continence in widowers and by

sudden reformation in masturbators. Malaria, gout and syphilis often produce neuralgia of the spermatic cord and testicle.

Clinical History.—This disorder is sometimes designated as irritable testicle. It may attack one or both organs. The pain varies in intensity, sometimes being greatly increased by the slightest touch; it may be spasmodic, continuous, localized or it may radiate over various parts of the body, and often becomes so severe as to cause collapse.

Treatment.—Massage, general hygiene, cold applications, galvanism, X-ray, etc. If caused from perverted sexual functions, Ignatia. Neuralgic pain, heat and over-sensitiveness of the parts, Hamamelis. When accompanied by hard and indurated growths, Aurum. Neuralgic pains with or without appreciable cause, Colocynthis, Magnesium phos. or Oxalic acid.

Varicocele.—Etiology.—This condition may be caused by anything which increases the flow of blood through the veins of the testicle and cord or interferes with the return circulation from these parts, as over-exercise, standing, long marches, constipation, constriction of the parts by the clothing, etc. It frequently occurs as the result of perverted sexual functions or habits—over-indulgence, unsatisfied longing, etc.—which cause passive and continuous congestion of the parts.

Clinical History.—Elongation and enlargement of the veins of the spermatic cord constitute this condition. There are two varieties, the symptomatic and spontaneous. The symptomatic rarely occurs. It is due to some intra-abdominal growth which obstructs the return blood through the pampiniform plexus of veins. These growths are generally renal in origin and malignant in character. Symptomatic varicocele is characterized by being painless and appearing late in life. With the appearance of a demonstrable abdominal tumor the veins of the pampiniform plexus rapidly increase to a considerable size.

Spontaneous varicocele is the most common affection of the male genito-urinary organs, being present to some extent in 10 per cent. of all men. Senn, in his recent examination of recruits, for the Hispano-American War, found 21.7 per cent. to have a varying degree of varicocele. He observed that it was most common in the strong and robust, but in very few



FIG. 22.—Varicocele. (Osborn.) (Monod and Terrilon.)

instances did he consider it of sufficient importance to exclude the applicant from military service. Fifty per cent. of those suffering with varicocele are ignorant of their condition, and of this number less than 20 per cent. never consider it of suf-

ficient importance to require medical or surgical relief. On account of the anatomical construction of the parts, varicocele occurs most frequently on the left side; a double varicocele sometimes exists. Varicocele is not necessarily associated with venous enlargement elsewhere. It is essentially a disease of early life. It may occur in infancy, invariably commencing before the twenty-fifth year. After the fortieth year, it generally diminishes in size and may entirely disappear or cease to cause annoyance. It may exist for years unnoticed; its progress is slow and irregular. Frequently, after reaching a certain size, it, without treatment, remains stationary; again, as after an epididymitis, it may increase rapidly. Hot weather or anything which debilitates or relaxes the cremaster muscle seems to make the varicocele more noticeable.

The dilatation of the veins varies from a slight turgescence and enlargement to enormous distension, elongation with thickening of their coats, and destruction of the valves (Fig. 22). This produces a tumefaction above the testicle which extends upward toward the external ring terminating in a cone-shaped end. In a large varicocele a second mass of veins may be located below the testicle and between it and bottom of the scrotum; occasionally, a few may be found between the cord and the scrotal partition. The varicocele, when of large size, appears as a pyriform tumor encroaching on the opposite side of the scrotum; the bluish color of the venous blood in the dilated vessels may sometimes be seen through the scrotal tissues.

When manipulated, the veins within the scrotum feel like bunches of angle-worms or cords. If doubt exists as to the diagnosis, the patient should be placed in the recumbent position and the scrotum elevated, when the tumor will be easily reduced; pressure should then be made at the inguinal ring and the erect posture assumed. If the pressure is strong enough to compress the artery there will be no change, but

if the pressure is only sufficient to compress the veins the scrotum will gradually fill up and become distended from below upward, as the blood is brought in through the arterial canal. Frequently the superficial veins of the scrotal walls are also enlarged. When the varicocele is marked there is usually some atrophy of the testicle, due not only to impairment of the blood supply, but to pressure. After the cure of the varicocele the organ returns to nearly its normal size.

Pain, discomfort and dragging referred to the scrotum, perineum, cord and back are often present, but they do not depend on the size of the varicocele. Neuralgia of the spermatic cord and testicle are sometimes associated with varicocele.

Treatment.—The traumatic and varicoceles of moderate severity are best treated by frequent cold sponging of the scrotum and support with a suspensory bandage. Marriage is to be recommended when the trouble arises from perverted sexual functions. When a varicocele produces reflex conditions or atrophy of the testicle, surgical assistance is often necessary, yet the indiscriminate operation of every varicocele about which the surgeon is consulted must be condemned. A number of methods of surgical relief have been employed to advantage. They should be selected according to the requirements of the individual case.

Keyes' Subcutaneous Ligation.—When there is but little relaxation of the scrotum, this is often the operation of choice. The scrotum is first washed with green soap and hot water, douched with a solution of Bichloride of mercury, 1-2000, and finally bathed with alcohol. The preparation may be made at the time of operation or some time before and the parts protected by antiseptic dressings.

The patient should stand beside the operating table so that if he becomes faint, which often happens after the puncture of the scrotal tissues, he may at once be placed upon his back

and the operation continued in that position. A nurse should stand at his side, to support him in the event of faintness. The distended veins of the pampiniform plexus are by touch easily perceived among the structures of the cord, and separated by manipulation from the vas deferens when they are moved towards the outer side of the scrotum, and with the thumb and forefinger of the left hand, the scrotal walls are compressed, separating completely the pampiniform plexus of veins from the vas deferens. The Keyes' or Reverdin varicocele needle is threaded with one strand of strong twisted Chinese silk eighteen inches in length, and the scrotum, duly anæsthetized by proper anterior and posterior local Cocaine anæsthesia, is transfixed just above the thumb and finger between the veins and the vas deferens. When the eye of the needle emerges on the opposite side of the scrotum the silk is liberated with a tenaculum and disengaged. The punctured scrotum is then traversed independently by the needle and one strand of silk. The needle is withdrawn until its point clears the veins, but without allowing it to emerge at the original point of entrance. The veins are permitted to join the vas deferens and the point of the needle is advanced on the outer side of the veins and under the dartos and made to emerge posteriorly at the exact point where the silk is protruding. The silk thread is placed in the eye of the needle and the instrument entirely withdrawn, carrying the silk with it. If more than one ligature is to be employed the extra ones should be introduced between the vas deferens and the plexus of veins while the patient is in the erect position. When the ligatures are in position the patient is placed upon the table. While the ends of the silk are firmly held, the scrotal wall is pulled away so that the shreds of dartos included in the loop at the posterior puncture are pulled free from the integument. The scrotum is elevated by an assistant and the ligatures tied. If two have been in-

troduced the upper one should be tied last. As this is the painful part of the operation a few inhalations of Chloroform may be given. The silk should, for security, be tied forcibly with a triple knot, the ends cut short and allowed to sink into the scrotum. Bleeding seldom occurs. The punctured spot is dusted with Iodoform or closed with Iodoform collodion, dressed with absorbent cotton, and the parts supported in a suspensory bandage. Pain and swelling sometimes follow. Convalescence is rapid and return to business is often per-

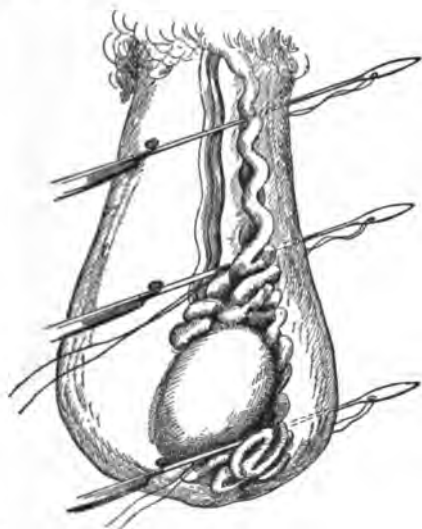


FIG. 23.—Diagram Showing Operation for Varicocele. (Keyes.)

missible about the third day. A hard spot remains at the point of ligation for a year and possibly longer. One ligature is often sufficient; it should be located just above the testicle; when two are required the second should be placed about one-half an inch below the upper end of the varicocele. When there is a large mass of veins below the testicle a third ligature at this point is often advisable (Fig. 23). In this surgical procedure, as well as in all other operations for

varicocele, atrophy of the testicle may follow. Occasionally the silk does not become encysted, and a sero-purulent fluid accumulates around it burrowing its way to the surface when should be evacuated. The ligature soon becomes liberated and the sinus closes. Infection and purulent infiltration of the scrotum has followed this operation, but free drainage and antiseptic dressings will, however, soon relieve the condition.

Subcutaneous ligation is sometimes performed as follows : Two or more hare-lip pins are inserted between the separated veins and the vas deferens, the first being carried through the scrotal tissues in the upper third of the scrotum and a second about the junction of the middle, with the lower third of the cord. A straight varicocele needle, threaded to the middle with silk, is introduced at the upper pin opening. As the point enters, it is carried between the mass of veins and dartos so as to make its exit with the pin at the opposite side. The silk loop is loosened and the needle withdrawn. The loop is passed over the pin and the anterior ends securely and firmly tied around the pin. A second ligature is fixed at the lower pin in a similar manner. The parts are dressed antiseptically and covered with an abundance of gauze. The pins may be removed on the third day.

Open Operation for Varicocele.—Excision of the dilated veins should be the operation of choice when the scrotum is relaxed and the veins elongated. It is performed as follows : A vertical incision about two inches in length is made over the most prominent portions of the veins, along their longitudinal axes, the skin, dartos and fibrous investment of the cord being divided. The lips of the wound are seized and held open with blunt forceps which retract and expose the tissues, while the veins of the pampiniform plexus, enclosed in its glistening sheath, are freed by blunt dissection. An aneurism needle is passed beneath the veins at the lower end, and, after being threaded with No. 3 catgut, is withdrawn. A

second ligature is placed in a similar manner at the upper end. The ligatures are tied tightly with a triple knot while the testicle is supported by an assistant, the lower one being secured first. The intervening veins are removed. To prevent slipping of the ligature each stump should be transfixed with a needle threaded with one end of its ligature, then the upper and lower ligatures are tied together; this shortens the cord and raises the testicle to its normal position. Sometimes it is best to use drainage for twenty-four hours, although it is usually unnecessary. The connective tissue and dartos should be approximated over the stump by a continuous cat-gut suture and the integument with three or more silk-worm sutures. The parts should be dressed antiseptically and the dressings held in place by a cross of the perineum or a T-bandage.



FIG. 24.—Henry's Scrotal Clamp.

Ablation of the Scrotum.—Excision of a portion of the scrotal sac to form, as it were, a natural suspensory, has had numerous advocates. The concensus of opinion, however, is that as a cure for varicocele it is not a success, but as an adjunct to an operation upon the pampiniform plexus for varicocele it may be beneficial. The scrotum having been properly prepared, not omitting the application of lime, soda and water, the dependent portion of the sac should be emptied by pushing up the testicle, cord, etc., as far as possible, and a Henry curved scrotal clamp (Fig. 24) applied closely below them. A number of hair-lip pins should be introduced beneath the lower border of the clamp to prevent retraction of

the dartos or the scrotal tissues after its division and before the introduction of the sutures. The lower redundant portion of the scrotum should then be removed close to the convex border of the blade of the clamp with the scissors, and a sufficient number of chromicized catgut or silk-worm gut sutures introduced along the cut edges to keep the scrotal contents in place, and control the hæmorrhage. The clamp being removed, the sutures are tied and enough additional ones introduced to approximate the scrotal tissues, and a proper dressing applied. Support must be given to the scrotum and continued for some time. After the operation sanguinous oozing may be quite persistent, and attention must be given to the prevention of hæmatoma. The sutures must not be removed before the tenth day, otherwise gaping of the wound will occur.

Recurrence of varicocele may take place after the employment of any method of treatment if the erect posture is allowed too early. Three weeks should elapse before the usual vocation is resumed.

Symptomatically, the following remedies are indicated :

Arnica, in acute cases caused by traumatism.

Hamamelis, when the veins of the spermatic cord are inflamed and swollen; pain, often almost unbearable, in the spermatic cord extending into the testes; neuralgic pain extending from the scrotum to the abdomen and stomach, causing nausea and vomiting; scrotum relaxed and sweating.

Lachesis, walls of the veins of the pampiniform plexus and scrotum livid in appearance; associated mental depression pronounced.

Nux vomica, when the varicocele is associated with gout, gastric disturbances, constipation and mental irritability, with tearing pain in the spermatic cord, constrictive, stitch-like, crawling pain in the right cord and testicle.

Oxalic acid, agonizing neuralgic pain in the spermatic

cord, worse from motion; pain in the cord and testicle after emotion.

Pulsatilla, veins of the spermatic cord swollen, painful; drawing, tingling pain, which shoots down the thighs or up the back.

Sulphur, pressure and tension in the spermatic cord; testicles hang low; scrotum relaxed, covered with moisture; particularly useful when the condition has been increased by sexual excesses.

SECTION VII.

ANATOMY, ANOMALIES, INJURIES AND DISEASES OF THE SEMINAL VESICLES.

The seminal vesicles are situated in the retro-vesical space, one on either side of the median line along the upper border of the prostate and project laterally beyond it. They are elliptical in form, flattened a little antero-posteriorly, about two inches in length, their surfaces are somewhat convoluted, their apices point outward and upward, the lower portions being separated only by the expanded ends of the vas deferens, which are called the ampullæ of Henel; the space between the bodies forms an acute angle. By means of minute dissection these bodies proved to be continuous canals. The seminal vesicles are hollow organs, their walls being composed of three coats, the external fibrous, the middle, muscular composed of a circular and longitudinal layer; their cavities are irregularly trabeculated, the inner coat or mucous membrane, containing a large number of tubular glands, which secrete an alkaline, gelatinous, viscid, gray or grayish-blue fluid of high specific gravity without special odor. The epithelium in the youth is cylindrical, becoming flattened or cuboidal in old age. Microscopically, the seminal fluid is composed of large, oval or irregular masses of mucus, granular phosphates, leucocytes, epithelial cells, with pigment granules in the ends, spermatozoa, and sometimes small yellow masses composed of mucus, phosphates and an occasional calcareous concretion. At the upper portion of each vesicle there are two or three openings, the exits of short canals placed at an acute angle to

the cavity of the vesicle, leading into little chambers in the walls of the organ. At the lower expanded end each organ becomes continuous with the ejaculatory duct, which is about the diameter of a knitting needle. The ejaculatory ducts lie parallel to each other in a lymph space in the prostate and open by slit-like orifices in the prostatic urethra on either side and near the anterior end of the veru montanum. On the inner side of each seminal vesicle is situated the vas deferens, the lower end of which is dilated and flattened antero-posteriorly. This cavity or pump opens into the lower end of the seminal vesicle by means of a short canal placed at an acute angle. The ampulla of Henel is lined with mucous membrane similar to that lining the seminal vesicles, and contains a similar fluid. The ampulla seems to act involuntarily, attracting the spermatozoa from the vas deferens and discharging them into the seminal vesicle, its contractile power differing from that of the seminal vesicle, which is largely under the control of the will. The arterial supply is derived from branches of the inferior vesical and the middle hæmorrhoidal. The nerves are from the hypogastric plexus of the sympathetic; the veins discharge into the prostatic and lateral plexuses, and the lymphatics into the pelvic ganglia. The seminal vesicles, ampullæ and sometimes the vas deferens can be distinguished by the finger-tip as they roll beneath the rectal wall on manipulation. They can be pushed a little to one side, though they immediately resume their usual position.

The function of the seminal vesicles is to store the spermatozoa between the acts of copulation, to furnish a fluid secretion which preserves the spermatozoa and probably stimulates, vitalizes and nourishes them. It also gives a medium for proper separation of these life points and expels the spermatic fluid into the prostatic sinus just before ejaculation near the consummation of the sexual act.

ANOMALIES OF THE SEMINAL VESICLES.

Anomalies of the seminal vesicles sometimes occur, but they are usually associated with other malformations of the deep genitalia. One or both vesicles may be absent; they may be fused together or they may join and open into a closed sac. They have been known to empty into the ureter. Their ducts of exit have united to form a common duct which, passing forward parallel to the urethra in the penis, opened at the glans penis, producing apparently a double urethra.

TRAUMATISM OF THE SEMINAL VESICLES.

Owing to the protected situation of these organs, injury from direct violence is not common, though it may happen from a punctured wound through the ischio-rectal region, during a prostatectomy or other surgical operation upon or near the vesical neck. After this accident the seminal fluid may for a long time when ejaculated flow back into the bladder, though this rarely continues and obstruction or sterility results. Traumatic spermato-cystitis may be followed by an acute epididymo-orchitis.

Atrophy of the seminal vesicles may follow castration. This condition is uncommon and has no clinical manifestations.

DISEASES OF THE SEMINAL VESICLES.

Acute Spermato-Cystitis.—Etiology.—The most frequent predisposing cause of acute spermato-cystitis is acute posterior urethritis, which may be of the bacterial, toxic, traumatic, chemical, gonorrhœal or tubercular variety. It is generally produced by the extension backward of an acute or, possibly, a chronic gonorrhœal urethritis, excited by the continued ingestion of food or drink containing alcohol, the indulgence in excessive muscular exercise, bicycling, long

railroad, automobile, carriage or horseback rides, continuous standing, excessive walking and, especially, sexual acts—coitus, masturbation or sexual excitement. Instrumentation or local treatment of the prostatic urethra in those predisposed, even when conducted with the utmost care and for justifiable reasons, may excite this disease. A rectal examination or massage of the seminal vesicles, when there is local disease in the deep genitalia, is not free from danger, as well as surgical operations or traumatism in this vicinity. The acute tubercular variety may be caused by hæmatogenic infection, or by extension from neighboring organs, etc.

Pathology.—The most extensive pathological changes occur when the disease originates from an acute or latent gonorrhœa; the tubercular and those caused by other pyogenic germs are less severe in character. The walls of the seminal vesicles present the usual evidences of inflammation, shading from a slight congestion and thickening of the epithelial lining of the vesicles to one in which the exudation extends into the surrounding peri-vesicular tissue, the exudation often producing a large homogeneous mass which encircles the prostate and fills the post-prostatic recto-vesical space. It may even involve the neighboring peritoneum, producing a localized pelvic or general peritonitis. The sac is filled and often distended with purulent matter, which may possibly contain gonococci or tubercular bacilli. If the purulent matter is considerable in amount the walls of the sac may be inflamed and ulcerated. The inflamed vesicle may rupture and discharge its contents into the bladder, the rectum, or both, producing a vesico-rectal fistula, or into the peritoneum, producing a general or localized septic peritonitis. When the prostate is involved, it is sometimes extremely difficult to decide whether the original lesion commenced in the seminal vesicles, ampullæ or the prostate, or whether they were all involved simultaneously. In abscesses in the male pelvis, with

pyemia and death, it may be impossible to differentiate those originating in these organs from those arising in the peri-vesicular tissues.

Clinical History.—One or both seminal vesicles may be primarily involved. The local inflammation may be of any grade of severity, from one with symptoms so transitory and unimportant that it passes unnoticed unless recognized by the rectal examination to one in which they are distressing and serious. The disease may develop gradually, but more often, after some of its well-known exciting causes, the advent is abrupt. The most severe forms follow a gonorrhœal invasion of the posterior urethra and are generally associated with an epididymitis, an epididymo-orchitis, a differentitis or an acute prostatitis. Pain, which is referred to the sacrum or supra-pubic region of the affected side, is common; it may be burning, aching and throbbing and is increased by urination and defecation. It may be lancinating or excruciating in character and extend upward and backward to the kidney, through the urethra, along the spermatic cord to the testicle, or down the thighs into the perineum and rectum. During the paroxysm of pain, the testicles are frequently drawn up by contraction of the cremaster muscles. The supra-pubic region over the inflamed sac becomes tender, and manipulation or palpation may cause severe pain; when the inflammation is intense and the exudation extensive, the inflamed mass can sometimes be distinguished by deep palpation in this region. The inflamed vesicle can usually be outlined by means of a digital examination through the rectum; the diseased organ is frequently extremely sensitive to the touch. The amount of tumefaction varies with the degree of inflammation. If the disorder is confined to one side, the inflamed vesicle may feel like an egg extending up and beyond the reach of the finger. When the peri-vesicular tissue is involved, the cysto-rectal space becomes thickened,

tumefied and very sensitive. The swollen mass may feel doughy, or even give some fluctuation indicating a peri-vesicular abscess. There is usually an associated swollen and sensitive condition of the prostate, which is generally at the same time inflamed, particularly over the line which corresponds to the situation of the ejaculatory duct. The pain and uneasiness in acute spermato-cystitis is increased by over-distension of the rectum by fæcal matter or gas; relief follows their removal. Sometimes the inflamed vesicle and surrounding tissues press upon the rectum producing a continuous desire to evacuate the bowels. If this desire for stool is allowed to continue without appropriate treatment, the straining, etc., will greatly augment the sufferings of the patient.

Persistent erections with chordee and nocturnal emissions are frequent and early symptoms, the ejaculated fluid being usually mixed with pus, occasionally with a little blood. As the inflammatory condition becomes more pronounced, the carnal desire grows less distressing; the emissions, however, continue and are usually accompanied by pain which often persists for hours. Micturition is increased in frequency and is accompanied by pain referred to the neck of the bladder or the fossa navicularis; it sometimes extends along the whole length of the urethra. The urine may be discharged in a small stream with great difficulty. There may be partial or complete retention, due to the great tumefaction of the parts, a prostatic or muscular spasm or an associated acute prostatitis. The urine at first is clear and free from shreds, pus, etc. When, however, acute spermato-cystitis develops as the sequela of an acute urethritis, the urethral discharge, as in epididymitis, generally ceases; but as the pain, fever, etc., disappear and the organ becomes able to empty itself through the ejaculatory duct, the urine again becomes cloudy and the urethral discharge returns. The degree of fever,

with its thirst, general erethism, restlessness, headache, vomiting, etc., varies with the intensity of the local disease, the temperature usually ranging from 100° to 103° Fahr. The fever, pain, etc., ordinarily subside by the fourteenth day. In the acute tubercular variety the range of temperature averages lower and the pathological lesion is generally bilateral.

Diagnosis.—In the more severe forms the patient, when in bed, assumes a characteristic position, reclining on the back with the thigh of the corresponding side drawn up to relieve the pressure of the abdominal muscles. The disease must be differentiated from acute prostatitis, acute posterior urethritis, urethro-cystitis, cystitis, pyelitis, renal colic, acute appendicitis, acute proctitis, etc. Acute spermato-cystitis may be associated with these conditions, as well as epididymitis and deferentitis. As an associated lesion, it is frequently overlooked, but, if a digital examination per rectum is made, the condition of the seminal vesicles will give physical evidence of their association in the diseased condition.

Prognosis.—When seen early, even in the most severe form, if the patient will go to bed and avoid over-exertion, a favorable prognosis can be given. The disease, with fever and pain, from over-distension of the vesicles, may advance for two weeks before resolution commences. The fever and pain will then cease, the ejaculatory ducts again become patulous, and resolution will rapidly follow unless there has been a pronounced involvement of the peri-vesicular tissues with the formation of pus, when instead of recovery a chronic condition results.

Treatment.—Rest in bed is of the utmost importance; if neglected, the course of the disease will be proportionately more painful and protracted. During the first two weeks, if the inflammation is extensive, the dorsal position should be maintained, the head resting on a low pillow, and it may be well to have the extremities slightly elevated.

To relieve tension on the vas deferens, the scrotum must always be properly suspended. This can be accomplished by any of the methods advised for support of the scrotum in epididymo-orchitis.

Poultices of flax seed and tobacco, 16 to 1, or a number of layers of cotton wool, moistened with a hot aqueous Boric acid solution, or one of Calendula or Hamamelis, a table-spoonful of the tincture to a pint of hot water, applied over the corresponding hypogastric and iliac regions, covered with flannel and oiled silk, and changed every two hours, give great comfort and relief. The hot fomentations must, however, be discontinued as soon as the pain stops or the urethral discharge reappears, with other signs of subsiding inflammation. Sometimes cold applications act well. The bowels must be evacuated daily, a mild aperient being at times required, but a violent one must never be administered. Rectal enemas of hot water, containing a teaspoonful of Glycerine to the pint, or Glycerine suppositories, facilitate an easy action of the bowels. When an enema is administered, a long, soft, rectal tube should be used to carry the selected solution well up into the sigmoid flexure. Rectal examination must be infrequent and massage avoided. Intense pain and loss of sleep, which are sometimes present, may necessitate the use of Morphine and Atropine suppositories and possibly Morphine hypodermatically.

The food must be light, milk being the classical diet, to which may be added the usual nourishment allowed in other inflammatory conditions. Pure water of all kinds, in moderation, will be of benefit.

The remedies most frequently indicated during the acute period are : Aconite nap., Aloe soc., Arnica mont., Belladonna, Bryonia alb., Cubeba, Ferrum phos., Gelsemium, Kali brom., Pulsatilla nig., Veratrum vir., etc., and during the convalescent period, Hecla lava, Hepar sulph., Lithium, Mercurius sol., Phytolacca dec., Selenium, Sulphur, etc.

Chronic Spermato-Cystitis.—Etiology.—Perverted sexual habits are unquestionably the most frequent causes of this disease, masturbation taking the first rank, particularly when practiced to excess by the growing boy. It is often occasioned by indulgence in unnatural sexual acts to excite great and prolonged gratification, to stimulate an orgasm when erections are imperfect or impossible, or by intercourse when the wife considers it a repulsive act to be allowed only at stated intervals and often without even a semblance of reciprocity. The practice of conjugal onanism, or the use of the condom, has a potent influence in producing the disease. It often occurs in the unmarried, who, from fear of contagion, lack of opportunity, particularly in those who play the part of triflers, taking great liberties with members of the female sex, but never consummating the act, or for moral reasons, while living a life of physical continence, by continued mental sexual incontinence, encourage a constant irritation and congestion in their sexual sphere. A similar condition may happen in recent widowerhood.

In fact, any action or thought which causes intense strain or hyperæmia of the sexual organs, if protracted and repeated at frequent intervals, may bring on this disease. Acute spermato-cystitis may terminate in the chronic variety. Chronic spermato-cystitis is often caused by the extension backward of an old urethritis, that does not reveal itself until years after the original invasion, it having lain dormant for a considerable period in the deep genitalia, when, after some instrumentation of the deep urethra, a bladder douche, excessive coition, etc., it becomes rekindled, and the inflammatory process, by continuity of tissue, travels up the ejaculatory ducts to the seminal vesicles. Chronic congestion or inflammation of the posterior urethra may occur in congenital or acquired stricture of the urethra, which, by extension, may involve the seminal vesicles. The reflex irritation, excited by a long or contracted

foreskin, hæmorrhoids, fissures and strictures of the rectum, etc., occasionally cause spermato-cystitis. Local conditions are not the only cause of this disease, for everything which lowers the general tone of the system may, by weakening the contractile power of these organs, interfere with their complete contraction and incite them to over-distension and disease. When the central nerve or the trunk connected with these organs is in any way injured or diseased, a spermato-cystitis may result.

Pathology.—The morbid lesion varies with the structures involved. When the pathological change is confined to the vesical wall the organ will be distended by a varying quantity of a muco-purulent material, sometimes bloody or black, the walls themselves being dilated, decreased in thickness and increased in density. The walls of the seminal vesicles may be greatly thickened and infiltrated, the inflammatory deposit occurring principally in the sub-mucous cellular tissue, and, to some extent, between the fibres of the muscular coat. When the exudation is pronounced, there is considerable infiltration and swelling of the peri-vesicular tissue in the vesico-rectal space. The muscular layer may become hypertrophied. When these conditions exist the cavity is usually contracted, though not infrequently it is dilated; when either occurs, the inflammatory changes greatly interfere with the normal elasticity and function of the organ. The inflammatory changes in the mucous membrane are similar to those occurring in inflammation of mucous surfaces elsewhere, and the amount of purulent matter present depends upon the severity of the inflammation. The peri-vesicular infiltration is at first composed of round cells and a serous exudate; later the exudate is absorbed and the round cells are transformed into fibrous tissue. An occasional small pus pocket may develop. The blood-vessels are thinned and tortuous, and, upon slight provocation, may rupture, imparting a red or bloody color to

the seminal fluid. When the bloody spermatic fluid is retained in the cavity of the vesicles for some time it becomes quite black. The condition of the mucous membrane also influences the character of the vesicular fluid. When the seminal vesicles are congested, the vesicular fluid becomes thick, gelatinous, and more difficult to expel through the ejaculatory ducts. If pus predominates, the fluid will be of a yellow or yellowish-green shade, or it may be blue, due to the presence of indigo. When the fluid remains alkaline it will contain a varying number of symplexions, *i. e.*, small, highly refractive, amylaceous particles, somewhat resembling starch granules. These are never present in the seminal fluid of boys, in fresh, healthy seminal fluid, or when the pathological process is well advanced. Symplexions are frequently present in the gray, sticky, mucus, urethral discharges so common in this disease. They cause the thickening of the vesicular fluid and over-distension of the seminal sacs in the lighter grades of inflammation. Symplexions are frequently present in the small globular masses and in the stringy shreds, one-fourth to one inch in length, about the size of the ejaculatory ducts, slightly protected by a mucus coating, which are voided in the urine. The vesicular fluid may contain bacilli coli communi, etc. The alkaline condition of this fluid inhibits the growth and brings about the death of the gonococci, which may have been the exciting cause. Gonococci are, however, frequently present in the urine, being brought down from co-existing disease in the prostatic urethra.

Occasionally, in the wall of the vesicle or surrounding tissues, the inflammatory exudation breaks down and small abscess cavities, which may remain isolated, be absorbed, or, by burrowing and amalgamating, form large abscesses, open into the neighboring organs and terminate in fistulæ, etc. The ejaculatory duct never becomes strictured, though it may be obstructed by the thick seminal fluid.

Clinical History.—Chronic spermato-cystitis may commence insidiously or it may be the sequela of an acute inflammation. When an acute spermato-cystitis has existed for eight weeks it may be considered chronic, though the clinical aspect will vary greatly, the severity and duration often having no special relation to the degree of local disease. The inflammatory symptoms, which are prominent in acute spermato-cystitis, are rarely present in the chronic condition, fever being uncommon unless an acute inflammation has been excited by bacterial infection or accidental or surgical traumatism. Functional and neurotic symptoms are, however, particularly pronounced. Pain of moderate intensity is not uncommon; it may be located in the supra-pubic or inguinal region of the affected side, in the lower part of the hip, in the bladder, along the sciatic nerve or down the anterior part of the thigh, at the root of the penis or in the glans, in the scrotum, perineum, sacrum, rectum, or it may run down the spermatic cord to the testes or up to the kidneys. It is aggravated by sexual congress or excitement without gratification, as well as anything which intensifies the local inflammation, such as horseback riding, automobiling, wheeling, constipation, exposure to cold, uric-acidæmia, instrumentation, etc. Defecation is often painful and the act may be followed by a dull aching pain high up in the rectum; this form of pain may come on spontaneously at night and is similar to that produced by fissure of the anus. The perineal region is often so sensitive to touch that soft seats are avoided and hard ones selected so that the tuber-ischii will take the weight of the body; a ring cushion may be necessary for comfort.

Generally, the meatus urinarius is bathed with a sticky discharge which may cause agglutination of its lips; it may be quite profuse or only noticeable after a constipated or diarrhœic stool. Microscopically, this fluid is composed of symplexions, dead and living spermatozoa, leucocytes, etc., as

already described. Before the era of careful bacteriological and microscopical examinations this discharge was attributed to an old gonorrhœa, the improper use of sounds, urethral douches, etc. Proper investigation generally reveals a clinical history of spermato-cystitis which has existed for a long period previous to the supposed causation. A urethral discharge is present often when a gonorrhœal history is absent, though on urethroscopic examination the prostatic urethra seems red and congested, but a discharge will be observed oozing from the patulous ejaculatory ducts, which, by its presence, induces the urethral inflammation. A gonorrhœal infection may, however, rekindle and aggravate an old spermato-cystitis. The urethral discharge which occurs in chronic spermato-cystitis is occasioned not only by the over-distension of the cavities of the vesicles by the products of catarrhal inflammation and consequent incontinence, but also by the patulous and relaxed condition of the ejaculatory ducts, the result of co-existing inflammatory changes in its walls. These pathological conditions explain the reason of the associated urethral discharge as it appears continuously, increased at stool, when urinating or during muscular effort. This urethral discharge is also influenced through the nerve connections of these organs, by sexual excitement, by the presence of a sensuous woman or of certain women; sometimes even by a woman's photograph.

Excessive and prolonged sexual excitement with continued priapism, gratification giving no relief, is an early manifestation of this disease. In some, the lascivious desire is so pronounced and annoying that the inclination to self-abuse cannot be withstood, while in the lesser forms, the desires and erections amount only to a slightly increased erethism. In the married, these early symptoms are often overlooked until a rapidly diminishing power of erection and impotence with loss of sexual desire occurs, coitus affording but little satisfac-

tion, the ejaculation being incomplete, unsatisfactory and occurring too early, or it is accompanied by pain, sometimes agonizing, constituting the so-called spermatic colic. Pathological nocturnal emissions are frequent, *i. e.*, two or three every night; they may occur only in cycles, with or without lascivious dreams, finally without mental cognizance. They may be accompanied by pain or followed by great depression, etc. Sexual congress has no effect upon their occurrence. In the more chronic form of this disease, diurnal emissions occur and may be produced by any lascivious sight or thought, or may even happen without the mind being directed to the subject. The too frequent advice to gratify the sexual erethism has caused untold harm. Impotence often becomes a source of great anxiety, especially when the former condition is compared with the present or the stated power of friends, as well as the criticism of some female which causes the belief that the manly powers have been lost. Perverted sensations are frequently noticed, such as coldness of the glans penis, or a shrivelled feeling of the penis. Occasionally there is a sensation as though the scrotum were abnormally contracted; the parts may feel uncomfortably relaxed. These sensations may alternate in the same patient, or there may be a loss of feeling in the testes, which, in time, engenders the belief that the organs are undergoing atrophy.

Lesions of the seminal vesicles often produce urinary symptoms even when no associated urethral or bladder lesions exist. Micturition is increased in frequency especially during the day; it may be painful and burning. This pain may extend along the whole length of the urethral canal; it may be referred to the fossa navicularis or the neck of the bladder; sometimes it is more severe at the end of the act; it is generally increased after excessive coitus or sexual excitement; it may even cause incontinence of urinary retention. The urine frequently contains phosphates in excess and often

quantities of oxalate of lime derived from the associated chronic prostatitis, which may irritate and congest the urethra. The urine voided may be albuminous from the admixture of the seminal fluid; when this occurs it is most pronounced in the morning. In a three-glass specimen, the first and last glasses will contain more albumin than the second. It will be more noticeable when taken after stool or massage of the seminal vesicles. Terminal hæmaturia may be present from some disease of the ejaculatory ducts. If the urine be taken directly from the bladder by means of a catheter there will be no evidence of albumin, etc.

Localized points of numbness and formication in the limbs and various parts of the body are not infrequent, inducing the belief that paralysis or some other dreaded disease is approaching. Sharp pains in the forehead, dull pains in the occiput as though the head were held in a vise, or a general dull headache, flashes of heat, chills up the back, etc., are common. Fuller records a case each of tinnitus aurium and one of seeming intestinal colic, and the author has known one of successive bilious attacks relieved and not returning after the cure of chronic spermato-cystitis.

All reflexes are aggravated by sexual excesses or excitement. The various reflexes may simulate hysteria or neurasthenia, but it must by no means be understood that all the symptoms of hysteria or neurasthenia in the male are dependent upon diseases of the seminal vesicles.

The mental symptoms are generally very pronounced, their severity often bearing no relation to the magnitude of the local disease. Melancholic conditions predominate; there is a loss of courage and aggressiveness; all mental labor seems difficult; there is a tendency to delegate work to others, with underestimation of personal ability; aversion to the society of friends; mental apathy, mental efforts being tiresome; pronounced irritability, and a tendency to become irresolute,

quarrelsome or suspicious. The memory becomes somewhat impaired, with inability to concentrate the mind upon any subject, with a feeling that they have "lost their grip," or a fear that they are going insane, which if not relieved may terminate in suicide. Physical and mental unrest are characteristic, while the desire for change of residence, change in business principles, indecision, with irritable moods, brooding over the loss of sexual power, with a tendency to magnify the condition and its cause and effect, are ever in evidence. Sleep is frequently disturbed, and insomnia may be present.

Examination of the seminal vesicles per rectum, the technique of which is described under treatment, is very important, and much information is to be obtained thereby. The condition of the prostate is first investigated by the tip of the finger as it enters the rectum, and passes along the median sulcus, separating the two lobes of the prostate, to its posterior border; if the bladder is only moderately distended with urine and the tip of the finger travels backward, the tissues forming the bladder walls should feel soft and yielding. If it travels laterally and a little backward, the tissues appear resistant, firmer, and the indistinct seminal vesicle, somewhat pear-shaped if diseased, can be located and the lower two-thirds mapped out. The normal seminal vesicle, unless over-distended, cannot be distinguished by the tip of the finger in the rectum. When the pathological lesion is confined to the seminal vesicles it can usually be recognized by their rigid and well-defined outlines. When the seminal vesicles are diseased they become enlarged, sometimes to a considerable extent, owing to over-distension of their sacs with fluid and when pressed upon convey to the examining finger a doughy feeling or a sense of fluctuation. If the pressure is continued and the sac somewhat massaged, the swollen mass will become distinctly reduced in size, and at the same time a vesicular fluid, varying in amount from a few drops to two or three drachms, will

flow into the urethra and out at the meatus urinarius. When the enlargement is due to an inflammatory infiltration of the vesicular walls, the diseased sac is often contracted and its capacity consequently diminished. Sometimes the amount of fluid pressed out may be hardly discernible. If the circumscribed swelling is due to a peri-vesicular infiltration the mass outlined by the rectal examination may be irregular or nodular. The peri-vesicular infiltration may involve and fill the space in the centre between the vesicles downward to the prostate and extend laterally to the walls of the pelvis, the roof becoming firm, hard and unyielding. When present the infiltration is generally more abundant around the seminal vesicles and ampullæ. The inflamed vesicle is ordinarily painful and sensitive to touch; sometimes the digital examination of the parts is agonizing and may result in faintness. The pain caused by manipulation is neuralgic in character and diminishes with each stripping of the vesicle. As the condition improves the pain and sensitiveness on massage disappear. Generally the more extensive the peri-vesicular infiltration the less sensitive are the parts, the points of greatest sensitiveness always being over the diseased organ. If the spermato-cystitis is the result of the lowering of the body tone, the parts adjacent to the seminal vesicles will be relaxed, the prostate movable, the swollen seminal vesicle easily distinguishable and its contents evacuated. The pain and tenderness which may exist will usually be slight, but when the attack is acute or when an acute attack is engrafted upon a chronic condition, the examination of the parts will be more painful.

Diagnosis.—This must always be verified by a rectal examination. Under no circumstances is it judicious to make a diagnosis of spermato-cystitis without a proper local physical examination and the exclusion of disease elsewhere. Whenever mental decadence is present the seminal vesicles

should be interrogated, and frequently, when local disease in those organs is discovered and removed, the mental powers will return and the nervous manifestations will disappear. Cause and effect must, however, always receive proper consideration, as in the idiot or the sexual pervert, where the disorder originates in the diseased nerve centres, the genitalia at first being free from lesion. If the numerous reflex pains and sensations suggest spermato-cystitis, examination of these parts may reveal the cause of the disorder. Special care must be observed in the rectal examinations, or hyperæsthesia of the parts may be mistaken for local disease. In hysteria, the entire space reached by the tip of the finger is equally sensitive, which distinguishes it from the localized sensitiveness of spermato-cystitis and, furthermore, if massage treatment be instituted the patient will grow worse.

Nocturnal emissions which occur at intervals of one or two weeks or even in cycles of one, two or three successive nights, followed by a considerable period of rest without producing unpleasant symptoms, are entirely within the bounds of health. They must be distinguished from those of a pathological character, which are always followed by lassitude, etc. Impotence of an hysterical nature is always associated with a desire for society of women, which differentiates it from that due to pathological conditions of the seminal vesicles where there is not only loss of sexual power but aversion to the society of the other sex. In the impotence of spermato-cystitis the power of erection is gradually lost in contra-distinction to functional impotence, where, as the result of fear, contagion, unpleasant impressions of the partner, fear of incapacity to perform the act, etc., sufficient erection is impossible or the emission is premature, while on other occasions and in the morning on awakening the erection is perfect.

In chronic spermato-cystitis, with an accompanying urethral discharge, or where pus or shreds are present in the urine, the

entire genital tract should receive careful local examination, and the diagnosis be verified by the urethroscope, the cystoscope, the bulbous bougie, digital rectal palpation and microscopical investigation of the discharged fluid. If symplexions, leucocytes, dead spermatozoa with pus cells in their heads and the Heitzmann seminal vesical cells are present the diagnosis of spermato-cystitis may be considered established. Often a chronic urethral discharge is entirely dependent upon a chronic spermato-cystitis, and cannot be cured until proper treatment of the seminal vesicles is instituted ; it must not, however, be inferred that all persistent urethral discharges are due to such disease.

A burning pain referred to the neck of the bladder or fossa navicularis, in a urethra in which the bulbous bougie and the urethroscope reveal no evidence of local disease, should always excite suspicion of chronic spermato-cystitis, especially when a little glairy mucus has been noticed in the morning at the meatus, after a constipated or diarrhœic stool, or when shreds are present in the urine of those free from stricture, chronic urethritis, etc.

Prognosis.—This depends upon the degree of inflammatory involvement, the duration of the disease, and the concomitant conditions. When the inflammatory induration is moderate in degree, simply interfering with the mechanism of ejaculation, and the patient is under thirty, it can be quickly cured; when the walls of the vesicles are infiltrated and thickened a longer treatment will be necessary. If the peri-vesicular tissue is indurated and thickened, the treatment necessary for a cure will be correspondingly protracted. The average duration of treatment necessary to produce a cure is from two months to two years, though occasionally even a longer period may be required. While some apparently recover without treatment, generally the disease becomes gradually or rapidly worse, with an accompanying loss of sexual vigor and the development of

mental symptoms, which turn business successes into failures and a man of good disposition and impulses into an irritable, morose, suspicious, irascible, shrinking being, and often into a condition verging on insanity. Uncomplicated chronic spermato-cystitis occurring between thirty or forty usually responds rapidly to proper treatment; between forty and fifty it is more tedious and prostatic complications are liable to occur; after fifty, complications are common, protracted treatment is necessary and the condition is often incurable. The better the general physical condition the more favorable the prognosis.

Treatment.—This must be directed towards restoring the power of ejaculation through the re-establishment of the normal contractile expulsive power of the organ and by the removal of the inflammatory material deposited in the walls of the seminal vesicles and in the neighboring tissues. Usually massage of the organs, as originated and applied by Fuller, is all sufficient. He describes his process, which he designates as stripping the seminal vesicles, as follows: "The patient, should present himself with full bladder, in the thin subject this is unnecessary, and while standing with his knees straight, bend the body forward at right angles over the arm of the operating chair. Then the operator should introduce the forefinger of the right hand well into the rectum and with the fist of the other hand exert firm counter-pressure over the pubes. By these means the end of the forefinger will in all ordinary cases reach well beyond the posterior margin of the prostate, and the bodies of the vesicles can be thus detected, one on each side beyond the posterior prostatic border. Only the lower half of the body of the vesicle can be felt ordinarily with the finger, the rest being beyond reach. After the forefinger has been so introduced, firm pressure should be made by its tip on the body of the vesicle to be treated, as far back as it is possible to reach. When the perineal muscles are especially tense, firm pressure must be made against them

with the closed fist sufficient to overcome their resistance and allow of the further introduction of the finger. If the operator has not sufficient strength he can press the elbow with the corresponding knee, care being taken to keep the wrist straight and the finger in the line of the forearm. When the finger tip reaches the highest possible point over the seminal vesicle the first joint is slightly bent, and, while pressure is maintained, it should be slowly and firmly drawn forward in a somewhat zigzag motion along the line of the vesicle. The manœuvre is aided by the counter-pressure over the pubes with the free hand. This process may be repeated several times in connection with each vesicle. In this manner some of the



FIG. 25.—Rubber Finger-stall and Paper Protection for the Finger.

vesicular contents, provided the sac be diseased and distended, can be pressed out along its ejaculatory duct and into the prostatic sinus. As has been stated, the stripping should be done on a full bladder. This form of treatment should not be repeated in less than four days, the usual period being once a week." The finger should always be protected by a thin, well-fitting, rubber tissue finger-stall, which not only shields the operator, but precludes irritation of the mucous membrane of the rectum by the finger-nail. The surgeon may further protect himself by wrapping a double piece of toilet paper around the middle and the base of the finger which is held in place by the free end of the finger-stall (Fig. 25). Felki and Swin-

burne have invented an instrument for massage of the seminal vesicles and prostate, which has acted very satisfactorily.

When a simple inflammation of the muscular wall exists with an accumulation within the cavity of inspissated and thickened spermatic fluid, its removal by massage gives the muscular apparatus time to regain its tonicity. If the sac is thickened by peri-vesicular inflammation, the massage causes it to soften and disappear.

There are some precautions which must be observed in this variety of local treatment or unsatisfactory results will follow, *i. e.*, acute spermato-cystitis, ampullitis, epididymitis, deferentitis, etc. If evidence of acute inflammation exists, massage is contra-indicated. In the first treatment it is advisable to apply moderate pressure only with the finger-tip and strip each vesicle two or three times, the duration and vigor of the massage being gradually increased. Should manipulation increase the tenderness it must be discontinued for a few weeks and resumed only after the acute symptoms have subsided. The urine should always be voided after the massage and the dislodged seminal fluid examined, as the progress and success of the treatment may be determined by the quantity and quality of the deposit in the bottom of the receiving glass. If the urine voided after massage is turbid from the presence of pus, this form of treatment must be discontinued until the acute symptoms have subsided.

Excellent results are obtained by alternating the above treatment every fifth day with the local application to the parts of heat or cold, using iced water or alternately hot and cold water, through a rectal psychophore. Irrigations of the rectum every night, by means of the author's double current recto-genital tube, with a normal salt solution, or one of strained flaxseed or chamomile tea, at a temperature of 115° to 120° Fahr., give great relief to the pain, reduce the congestion of the parts and facilitate the removal of the inflammatory exudate.

Electricity in many of the more chronic cases is of great benefit. Faradism with a high tension coil of at least fifteen hundred yards can be employed, using the ordinary rectal electrode (Fig. 26) in the rectum, the other pole being applied to the perineum or sacral region, with a current comfortable to the patient, for from five to ten minutes, every second or third day. Galvanism, applied by means of King's rectal electrode is often more satisfactory. The hard rubber sheath of this instrument prevents injury to the mucous membrane, while numerous slits open into and upon the small metallic tip within the cavity, which also has a connection for the attachment of a water supply. After the electrode has been introduced into the rectum, the negative pole connected with it and the positive applied over the sacral or lumbar region, a

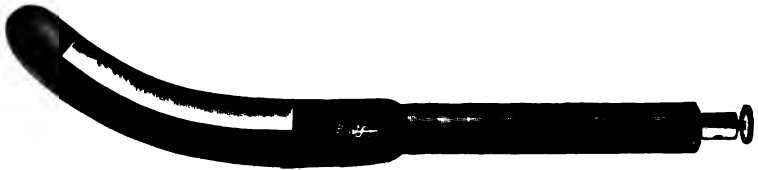


FIG. 26.—Dommer's Rectal Electrode.

normal salt solution sufficient in amount to slightly distend the rectum is forced through the hollow electrode. As soon as a sense of fulness is noticed by the patient the water supply is stopped and a current of from two to ten milliamperes may be turned on for two or three minutes. The great advantage of this instrument is that the galvanic current is applied evenly to all the tissues located adjacent to the rectum. The faradic current can also be administered with advantage in the same manner.

Light outdoor exercise is advantageous. The diet must be nourishing and easy of digestion. During active treatment anything which irritates the genital organs or brings about sexual excitement must be avoided. Sexual congress, as a

rule, should be prohibited during the first months of the treatment, and often until a cure is accomplished ; in the married, however, intercourse is sometimes permissible and even beneficial. The question can best be determined by a digital examination of the seminal vesicles a few hours after coitus ; if they appear firm and but little vesicular fluid is removed by massage, the act has not been harmful and it may be repeated once a week ; but if they are swollen, tender to the touch and considerable fluid can be expelled by stripping, coitus must not be repeated until the parts are in a better condition. If the urine is over-acid, an alkaline may be given to advantage, and if cystitis, etc., are present, they must receive appropriate treatment. Associated chronic prostatitis or posterior urethritis will also need attention, though, as a rule, local treatment of these conditions should not be instituted until the spermato-cystitis is cured or well under control. The testicles must in all cases be supported by a suspensory bandage to prevent dragging or sudden pulling on the vas deferens.

The following remedies have, from their symptomatic indications, been successfully employed :

Agaricus muscarius.—Strong sexual desire, but no pleasure in the act. Ejaculation very late and unsatisfactory. Emissions painful, followed by burning in the urethra. Relaxation of the penis. Frequent nocturnal emissions. Discharge of viscid mucus from the urethra. Sensation as though a drop of cold urine was passing. Disagreeable sensation or tickling on glans penis. Burning sensation in urethra on voiding the urine. Micturition intermittent or some retention followed by dribbling. Dragging or spasmodic pains in testes and cord. Coitus followed by great weakness. Useful in the bad effects from sexual excesses. Chorea from masturbation, etc.

Agnus castus.—Sexual desire diminished or almost lost, nothing excites an erection. Discharge of seminal fluid when

straining at stool and during micturition. Urethrorrhœa ex libidine. Emission at night after an embrace; seminal fluid watery or yellow, scanty, odorless. Disagreeable sensation in prostatic urethra while urinating. Relaxation of the testes and scrotum; crawling sensation in the scrotum. Penis small, flaccid, cold. Melancholia, fear of approaching death. Heaviness and pressure on the head. Great debility. Sleeplessness, though very tired. Useful in those who have carried sexual indulgence to excess and are troubled with mental incontinence and physical inability.

Ambra grisea.—Violent erections without carnal desire. After erection, tingling in forepart of urethra and burning in the region of the seminal vesicles. Coitus delightful, voluptuous. Bloody emissions. Ejaculations too early, too weak. Sensation as though a few drops of urine were being expelled from the urethra; burning at the meatus. Dragging pain in spermatic cord, extending to the testes. Smarting, burning and stitches in the testicles. Coldness and swelling of the scrotum. Penis cold, numb, retracted. Indicated in thin, nervous men.

Ammonium bromide.—Spermato-cystitis accompanied by pronounced mental distress.

Caladium.—Relaxation of the penis during coitus, without cognizance as to the presence of the ejaculation; no orgasm. Imperfect erection with premature orgasm. Nocturnal emissions with or without dreams. Glans penis and genitals relaxed and cold to the touch. Low-spirited, gloomy, fretful; attacks of faintness; lewd thoughts without erections; disinclination to move or act. Effects of masturbation.

Calcarea carbonica.—Imperfect sexual power. Great prostration after coitus, followed by weakness and trembling, especially in the knees, with headache and vertigo. Burning and tingling when semen is ejaculated. Erections only induced by handling; intromission followed by immediate emis-

sion. Weakness, excitability, anger and general giving way. Discharge of a mucous fluid from urethra during stool and when urinating. Scrotum relaxed, hangs down. Pain in spermatic cord. Mental application difficult. Fearful they will lose their reason. Nervous relaxation; ill-humored; great debility and emaciation. Indicated in those who have indulged in excesses, settled down to a normal life and find they have more desire than physical ability.

China officinalis.—Is often beneficial for the weakness following sexual excess or when nocturnal pollutions have been frequent and copious, causing nervous exhaustion and irritability.

Conium maculatum.—Imperfect erections; emissions without erections. Excessive seminal emissions from sexual excesses or celibacy. Sexual desire increased. Emissions while caressing. Sexual weakness with erethism and premature emission. Discharge of whitish fluid from the urethra during stool, with every emotion and after urinating. Frequent urging to urinate with burning at the neck of the bladder. Flaccidity of the genital organs. Cutting, sticking, griping pains in the testicles, with pain after erection. Sad, anxious, low-spirited. Numb feeling in head. Melancholy of celibacy. Especially indicated in complaints from denial of carnal desires.

Eryngium aquaticum.—Excessive erotic priapism.

Gelsemium.—Spermato-cystitis accompanied with considerable local pain; urination accompanied with a sensation half painful and half pleasurable.

Lachesis.—Erections feeble; inability to accomplish the act. Pollutions at night; emissions during the midday nap followed by weakness, headache and loss of consciousness. Excessive desire with constant erections. Discharge of milky fluid from the urethra. Seminal fluid has a penetrating odor. Discomfort referred to the bladder region. Discharge from the urethra after urinating. Pressure and burning in the ure-

thra during urination. Cutting, sticking pains in forepart of urethra. Especially useful in the early stages of sexual disorders.

Nux vomica.—Erection easily excited. Pollutions without erections, followed by relaxation of the lower part of the body, with coldness of the feet. Pollutions occur mostly towards morning and are followed by headache and difficulty in walking. Relaxation of the penis during an embrace. Discharge of tenacious mucus from the urethra while urinating. Itching and burning in the urethra. Pain in the neck of the bladder before micturition, with tearing during the act and pressure afterward. Tearing, stitch-like pains in right testicle and spermatic cord. Aching and constrictive pains in the testicle. Over-sensitiveness to external impressions. Inclined to fault finding, etc. Useful for derangements of function following excesses of an early age.

Oxalic acid.—Sexual excitement; testicles tender to touch; general languor and lassitude. Oxaluria; excess of uric acid in urine. Micturition increased in frequency and accompanied with burning in the urethra.

Phosphoric acid.—Erections difficult or impossible; sudden relaxation of the penis during coitus. Intercourse followed by great exhaustion. Frequent and debilitating emissions, voluntary, involuntary, nocturnal or diurnal. Urethrorrhœa ex libidine. Discharge of a whitish fluid from the urethra when straining at stool or while urinating. Ejaculation occurs too early. Micturition frequent, profuse; urine milky, having a white sediment, urine contains an excess of phosphates. Burning at the neck of the bladder. Cutting in the prostatic urethra during micturition, followed by cramp-like pains in the small of the back. Penis and scrotum relaxed. Low-spirited, indifferent. It is particularly indicated in young men who have grown too rapidly, who are greatly debilitated from masturbation, pollutions or sexual excesses; pale face with sunken eyes and blue rings around them.

Platinum.—Sexual desire abnormally increased, with violent erections, especially at night; excessive sensitiveness and titillation in and upon the genital organs. Satyriasis. Micturition frequent. Urine slowly voided. Spasms and convulsions from abuse of the sexual organs previous to puberty. This drug is useful in boys who have masturbated to excess before puberty, who present hollow eyes, yellow skin, are sheepish and melancholy. Grauvogel says it will cure mental imbecility resulting from masturbation.

Salix nigra.—Excessive sexual erethism caused by sexual excesses producing the early symptoms of seminal vesiculitis are often controlled by this drug.

Tubercular Spermatocystitis.—**Etiology.**—The presence in the diseased organ of the tubercular bacillus and its ptomaines is the only cause. It may be hæmatogenic in origin and come from local lesions in other parts of the body. The primary focus of the tubercular disease may be in the sac itself or be due to extension from the prostate, a preceding simple or gonorrhœal spermatocystitis often exciting the local manifestation.

Pathology.—This malady usually begins as a sub-acute condition, causing pronounced thickening and some constriction of the walls of the vesicle. When it becomes chronic the thickening extends to the surrounding tissues and is characterized by its freedom from tenderness.

Clinical History.—The disease generally develops insidiously, for a time presenting no symptoms which direct attention to the seminal vesicles and may be revealed only by rectal examination. There may, however, be some little disturbance of the sexual power when it is associated with tubercular prostatitis or epididymitis. If the urine be examined, shreds from the prostatic urethra and ejaculatory ducts, together with a few pus corpuscles or leucocytes, may be present. Possibly a slight pasty discharge may have been noticed at

the meatus urinarius. As the disease becomes more **chronic**, all the symptoms of chronic spermatocystitis, general and reflex, appear. Anything, however, which improves the general tone of the system will reduce the manifestations of the disease, so that, when the general health is good, all subjective symptoms may, for the time being, entirely disappear. If not treated it may terminate in abscess or fistula.

Diagnosis.—If the general family history is consulted, and a thorough physical examination made, much information may be gained which will assist in making a correct diagnosis. Digital examination per rectum may reveal nodulations of the seminal vesicles, but more often a rectal examination at first gives no positive diagnostic information, except that in the tubercular variety the parts are more sensitive to manipulation than in the other forms of the disease. If repeated mechanical strippings of the parts are considered proper and applied, each successive massage will become more painful, differing from the results in simple chronic spermatocystitis, giving positive warning that the manipulation is injurious. Therefore, when doubt exists as to the variety of spermatocystitis present, the first massage should be carefully performed in order to avoid evoking an acute tubercular spermatocystitis.

The seminal fluid removed should always be examined microscopically for tubercular bacilli. The testes and appendages should also receive a careful examination, as they frequently give confirmatory diagnostic evidence.

Prognosis.—Recovery must not be expected, but proper treatment may afford great relief. The ejaculatory ducts sometimes become occluded and the tubercular vesical sac may become encysted, where it may remain as an innocuous body for years.

Treatment.—Bacillinum 200, a dose every seventh day, should be administered, in addition to the general remedies

indicated for chronic spermato-cystitis. The diet must be carefully regulated to give the greatest nourishment without overtaxing the digestive organs. Hæmaboloids increase the quantity of red blood corpuscles and build up the system. Russell's emulsion of mixed fats and cod liver oil must not be forgotten; Hagee's cordial of cod liver oil is of singular benefit. Massage of the parts generally increases the inflammation; it may be attempted only after treatment has improved the systemic condition. If a relaxed state of the vesicles exists, gentle stripping will sometimes be beneficial. Where there are associated urethral and bladder complications, all local treatment of these parts must be avoided until the disease in the vesicles is ameliorated, as the seminal vesicles are very intolerant of instrumentation when invaded by a tubercular inflammation, and manipulation may cause unpleasant symptoms and sometimes death. After the spermato-cystitis has been properly relieved, if the bladder irritation or urethral discharge still continues, bladder douches of four to six ounces of a hot aqueous solution of Bichloride of mercury, 1-15,000 to 1-30,000, with natural expulsion of the same per urethra, repeated once every four days, may be of benefit. Climatic changes do as much, if not more, for these patients than all other methods of relief combined. A moderately high altitude, with dry and mild, cool air, which allows of out-of-door employment or recreation, should be advised. Freedom from business cares or anxieties is important. If these means fail to relieve and the other genito-urinary organs and the system in general appear free from tubercular deposits, the removal of the diseased parts may be advisable.

Cystic Disease of the Seminal Vesicles.—It is possible that this condition may be caused by obstruction in the ejaculatory ducts, or the closing of a duct of one of the sacs situated in the walls of the seminal vesicles. These cysts may be small and of no consequence, or of considerable size.

Jacobson reports a case in which the seminal sac contained ten pints of brown serous fluid which was apparently cured by two aspirations. Most cysts of the seminal vesicles, however, which have been investigated have proved to be due to distension of some portion of the duct of Muller or the presence of echinococcus cysts between the rectum and the bladder. Cysts of the seminal vesicles give rise to no special symptoms, except those common to chronic spermato-cystitis.

Treatment.—Permanent drainage or removal is often necessary, though evacuation of the cavity by aspiration followed by injection of a 10 per cent. emulsion of Iodoform and sterilized sweet oil, or a 5 per cent. solution of Carbolic acid, has been curative.

Concretions in the Seminal Vesicles.—As a rule, these calculi have no clinical symptoms. It is not unusual to find a number of small concretions in the seminal vesicles of the aged. These solid masses are composed of spermatozoa, mucus and epithelium. They are whitish in color, growing darker with age, finally becoming calcified. These may so obstruct the ejaculatory duct as to cause sterility, painful seminal emissions, frequent urination, tenesmus, and many symptoms of posterior urethritis. Sometimes they induce spermatic colic, which occurs at the moment of ejaculation during coitus or a nocturnal emission. The pain is often so severe as to cause nausea. It is located about an inch up the rectum or at the neck of the bladder, and from thence it radiates to the testicles or up the posterior walls of the pelvis. If the obstruction is only partial, the colicky pain will soon disappear. If the occlusion is complete, emission may be lacking and the colic may continue for from fifteen to thirty minutes.

Treatment.—At the time of the attack a hot rectal douche often relieves or shortens the duration of the pain. Relief is sometimes given by introducing the finger into the rectum

and pressing upon the point where the pain is felt. Sometimes the concretion can be forced out by gentle massage, or crushed and removed by pressure against a steel sound in the urethra. These means failing, enucleation of the seminal vesicle may be necessary. .

Malignant Growths of the Seminal Vesicles.—These are rarely of primary origin, and when present are generally associated with malignant growths of the neighboring organs.

Treatment.—The pain and onward march of the disease may be curtailed by the internal administration of Arsenicum, Conium, Condurango, etc.

Abscess of the Seminal Vesicles.—Occasionally, as a result of a simple or tubercular inflammation of the seminal vesicles, the ejaculatory duct becomes occluded. The symptoms are similar to those of a prostatic abscess, but are generally easily differentiated by the rectal touch. If not surgically relieved it may open into the peritoneum, producing a fatal peritonitis, or, infiltrating the peri-vesicular and peri-prostatic tissues, go on to the development of an ischio-rectal or pelvic abscess. Sometimes it opens into the bladder or rectum.

Treatment.—When pus forms in the vesicle and does not discharge itself through the ejaculatory ducts, or a peri-vesicular abscess is present, evacuation through the perineum with proper surgical drainage will be necessary. Untreated cases do badly, resulting in fistulous tracts, etc., which cause much future annoyance. When the abscess is the result of an inflammation other than of a tubercular or malignant nature, incision and drainage will be sufficient. When, however, it is due to the latter causes, the walls of the cavity must be thoroughly curetted or excised or a chronic fistulous tract will result.

When an abscess from any cause develops in the vesicle and does not empty its contents through the ejaculatory duct, or

forms in the peri-vesicular tissues, it should be evacuated by aspiration or the trocar and canula, the cavity cleansed with a Bichloride of mercury solution, 1-2000, and over-distended with Vaseline and Iodoform, 1-9; (2) by perineal and prostatic section, locating the pus cavity with the Guiteras grooved trocar and canula, and opening it to proper size for drainage, etc.; (3) some have opened the cavity through the rectum, curetted and drained, but this method has the disadvantage of sometimes leaving a blind fistula, the free end opening into the rectum, or the formation of a vesico-rectal fistula; (4) perineal cystotomy, opening the pus sac with bladder drainage. This will be the operation of choice where there is associated urinary retention.

If the abscess has opened into the bladder or rectum, irrigation of the cavity twice daily with a mild antiseptic solution is called for, together with Urotropin, Silicea, Hepar, Sulphur, Echinacea, etc.

Extirpation of the Seminal Vesicles.—Sometimes a primary tubercular or malignant disease of the seminal vesicles, a calculus, etc., may necessitate the removal of the organ. In extirpating the seminal vesicles, numerous operations have been employed, *i. e.*, Zuckerhandl, Moullin, Van Dillel, Kraske and Rydygiers.

Zuckerhandl makes a concave incision across the perineum, the concavity looking toward the rectum and extending below the tuberischii. The perineal muscles, together with the portion of the levator ani arising from the pubes, are cut through and the rectum drawn back. Keeping fully an inch from the rectum, with a finger in the rectum and a steel sound in the urethra as a guide, the incision is carried largely by blunt dissection down to the vesicles, but the pathway is at best narrow and deep, hæmorrhage is profuse and the ligation of the vessels difficult. It is rare that the vesicles can be removed by this route except in pieces by the curette. When

they cannot be enucleated the location must be curetted and packed with gauze, and treated surgically as indicated.

Moullin makes a similar cut behind the perineal centre, the rectum being pressed down into the concavity of the sacrum, with division of the fibres of the levator ani and the fascia, which keeps the seminal vesicles against the bladder. If the incision is made in the middle line above or on a level with the upper limit of the prostate, there will be little danger of opening the veins of the prostatic plexus. Deep pressure on the supra-pubic region will then press down the bladder, prostate and seminal vesicles, when the latter can be easily reached, separated from the under surface of the bladder and removed.

SECTION VIII.

ANATOMY, ANOMALIES, INJURIES AND DISEASES OF THE PROSTATE.

Anatomy.—The prostate (*προστάτα*, standing before), consists of a firm muscular mass encircling the neck of the bladder. When normal it is about the size of a horse chestnut, the larger half being situated below the urethra and between it and the rectum. Its apex rests upon the posterior surface of the triangular ligament, its base is directed upward and is pierced by the ejaculatory ducts and the urethra. Between the fibres of the organ are numerous mucous glands which open by ducts into the prostatic urethra. It is surrounded by a firm fibrous coat, continuous in front with the true pelvic fascia; it extends backward over the bladder, laterally it blends with the common covering of the bladder and rectum and underneath with that enveloping the seminal vesicles. It also sends fibrous septa into the organ which divide it into numerous compartments. Some of its muscular fibres are continuous with those forming the wall of the seminal vesicles. It is separated from the pubic arch above and in front and from the rectum behind by a large lymph space in which, filled by a loose meshwork of connective tissue, is located the prostatic venous plexus. On the under surface of the prostate is a slight depression, which apparently separates it into two lateral portions, but the terms "lateral" and "median" are misnomers, there being no true division into lobes, though it develops in two distinct halves which unite to make the complete organ about the

fifth month of uterine life. The prostate is supported by the **pubo-prostatic ligaments** and the **levator-prostatic muscle**. The prostate is a sexual organ and has little to do with the act of urination. Its function is to supply a material to **liquify the seminal fluid** and to contribute to the **ejaculation of the spermatic fluid** during coitus; to supply a lubricant to the **urethral mucous membranes** at all times which will prevent damage by the acid urine as it is voided, and to aid in retaining the urine in the bladder.

ANOMALIES OF THE PROSTATE.

Malformations of this organ are exceedingly rare. It may be entirely wanting, with an associated non-development of the deep genitalia. Occasionally, accompanying exstrophy of the bladder, there is no development of that portion of the prostate situated above the urethra.

INJURIES OF THE PROSTATE.

On account of the protected location of the prostate, **traumatism** is extremely uncommon unless associated with such general mutilation of the body that the prostatic lesion becomes unimportant by comparison.

Wounds of the Prostate.—Those of a surgical nature made during an operation for enlargement of the urethral canal to permit the extraction of a vesicle stone, or by accident or design, by the passage of a steel instrument of improper curve, often bleed profusely. If the injury does not extend beyond the fibrous capsule of the gland, healing rapidly follows. If the wound extends beyond the fibrous capsule, pelvic infiltration, abscess, peritonitis and death not infrequently occur.

Treatment.—This must be conducted upon surgical lines best adapted to the individual wound.

DISEASES OF THE PROSTATE.

Congestion of the Prostate.—**Etiology.**—Acute prostatic congestion may be caused by or result from traumatism of the

prostatic urethra, from the introduction of sounds or catheters, the passage of abnormal urine or a vesicle calculus, the presence of irritating urethral injections, the elimination of certain drugs with the urine—Cantharides, Turpentine, etc.—the use of an imperfectly constructed or adjusted bicycle saddle, or a sequence of chilling of the body, etc.

Chronic prostatic hyperæmia is often excited by unnatural sexual acts, prolonged sexual excitement without gratification and particularly by protracted physical continence and mental incontinence. It may be conditioned by disease of the bladder or urethra. Irritation or traumatism of the prostate may cause hyperæmia, and, in a similar manner, disease of the rectum may induce this condition, or it may be a sequence of chronic constipation. It may also be produced by the voiding of highly concentrated urine as in gout, lithæmia, etc.

Clinical History. — The objective symptoms of active hyperæmia of the prostate are those of the early stages of acute prostatitis—sense of weight, fullness or pain in the perineum, back and testicles, rectal fullness and tenesmus and possibly some erotic sensation when evacuating the bowels. Micturition is increased in frequency and may be quite troublesome. Even if the calls to micturate are not increased in frequency, there is some pain and soreness in the perineum following the act, often accompanied with a voluptuous sensation as of an impending orgasm. The urine is usually over-acid. Hæmaturia may be present. Nocturnal pollutions are frequent. Ejaculation may be quite painful. The seminal discharge is sometimes stained with blood. Sometimes coitus gives relief.

Chronic or passive hyperæmia of the prostate presents as its most distinctive clinical symptom an over-secretion of the normal prostatic fluid (prostatorrhœa). The volume of the fluid is increased by any erotic thought or excitement. The

discharge as it appears at the meatus may be intermittent or **continuous**; sometimes it is so profuse that it keeps the glans **penis** moistened or even soils the linen. It may appear only at the end of micturition, when it gives the last few drops of **urine** the appearance of milk. It may be discharged in considerable quantities when straining at stool. This discharge is **thin**, white and milky, usually acid in reaction and contains no products of inflammation to distinguish it from a similar **discharge** which occurs in chronic parenchymatous prostatitis. The secretion is composed largely of mucus and granular phosphates and is the product of over-activity of the epithelial cells lining the prostatic tubules. The addition of a 1 per cent. solution of Phosphate of ammonia to a drop of this fluid on a glass slide will give the characteristic star-like, angular-pointed phosphatic crystals known as Böttcher's crystals.

The urine is usually of a low specific gravity, pale in color, alkaline or feebly acid in reaction, cloudy, and holding in suspension small masses of the prostatic secretion which are particularly noticeable in the first ounce voided. There are sometimes associated neuralgic pains referred to the back, groins, thighs, perineum and urethra. With the local symptoms there is pronounced hypochondriasis. Rectal examination of the prostate shows no special change in its size or contour.

Treatment.—The cause must be removed or discontinued. In acute congestion of the prostate the treatment serviceable in the early stage of acute prostatitis will be all sufficient. In chronic congestion, the bowels must be regulated, sexual hygiene observed, the urine rendered non-irritating by the ingestion of an increased volume of pure water, with the saline and alkaline varieties as required, and a non-stimulating diet. Exercise, particularly of the athletic variety, should be restricted. Daily hot sitz baths or hot or cold

rectal douches through the author's rectal irrigator are **very** efficacious. Prostatic massage is frequently helpful, and **the** passage of the cold steel sound through the deep urethra **alter-**nately with the instillation of twenty drops of an aqueous solution of Nitrate of silver, 1-20,000 to 1-500, or of Argyrol, 10 to 20 per cent., into the prostatic urethra every four to seven days is often of much benefit. For symptomatic medication see chronic prostatitis.

Acute Prostatitis (Prostatic Abscess).—Etiology.—When secondary, the predisposing causes are numerous and include everything which produces congestion of the parts or invites infection, *i. e.*, varicose conditions of the prostatic plexus, chronic prostatic disease, pathological lesions or over-distension of the bladder, damaged conditions of the deep urethra, calculi of the prostate gland or bladder; prolonged sitting on damp, cold objects, badly-fitting or improperly adjusted bicycle saddles; physical effort which causes a tension upon the perineum, such as excessive walking, running and lifting; chilling of the surface of the body, a gouty or rheumatic diathesis, alcoholic, sexual and other excesses, over-acidity or alkalinity of the urine, constipation or diarrhoea, lesions of the rectum or anus, ingestion of Turpentine, Cantharides, etc. The exciting cause is infection in some form, the most frequent being direct extension backward of an acute urethritis, or absorption of infectious materials which have lodged in the urethra, such as decomposed urine or the secretions of a prostatic or urethral catarrh; instrumental traumatism of a damaged urethra especially favoring its development, though it may occur when the urethra is seemingly perfectly normal. Acute prostatitis is not infrequently engrafted by improper catheterization upon a prostatic hypertrophy. Chemical irritation, sexual acts, etc., may also act as exciting causes. Lymphatic absorption of a morbid principle in a distant part of the body, or some infection entering through the general cir-

ulation as in measles, mumps, small-pox, etc., may produce this disease.

Lydston divides this disease into the following varieties :

1. Follicular, having its point of departure in a posterior urethritis, due either to an extension or a transference of the disease to the deep urethra.
2. Diffuse prostatitis, usually resulting from the extension of the acute follicular form. It may occur as a primary condition. The presence and degree of interstitial inflammation in the diffuse form depends upon the method of causation, *i. e.*, whether due to traumatism, catheterization, sexual excess, or improper douches, extension of the disease from the urethra or lymphatic infection. It may be associated with or terminate in localized or disseminated pyogenic infection.
3. Acute suppurative prostatitis, due to extension of a urethral inflammation, infection from local absorption or infection through the blood.
4. Disseminated suppurative prostatitis, miliary abscess.
5. Peri-prostatitis, which accompanies the other four varieties and may or may not be followed by suppurative changes.

Pathological Anatomy. — In the follicular variety the pathological process is confined to the follicles and glands immediately connected with the prostatic urethra, the surrounding tissues, the vessels and lymphatics being to some degree inflamed and thickened. The overlying urethral mucous membrane is reddened and swollen but not ulcerated. The organ is somewhat enlarged and tumefied. The diffuse form is characterized by involvement of the glandular, the inter-glandular, muscular and peri-prostatic tissues, the prostate often being increased to three or four times the normal size. The mucous membrane of the prostatic urethra is dark red, and the prostatic plexus of veins surrounding the organ distended with dark blood. The glandular elements are distended with an inflammatory exudate and pressure upon a section of the gland produces the discharge of a cloudy reddish fluid contain-

ing a little pus. When suppuration follows it may result in a circumscribed, single or multiple abscess, which may involve a small area or the whole of the prostate. In the follicular and diffuse forms, one or more glands may be involved, their ducts being obstructed and abscesses with thin walls form, which may rupture into the prostatic urethra and be followed by relief, open into the parenchyma of the gland and contaminate the whole organ, or if located upon the surface discharge outward and produce a peri-prostatic abscess and induce seemingly a recurrent infection. Disseminated suppuration, miliary abscesses, which generally occur from systemic infection, and peri-prostatic suppuration, which may or may not be associated with prostatic suppuration, require no special description.

Clinical History.—Acute prostatitis is one of the most important, serious and painful of the acute diseases of the genitalia of men. It often passes without recognition, the follicular variety being frequently mistaken for an acute posterior urethritis or cystitis. When the cause is pyogenic from lymphatic absorption or infection of an abraded surface after an instrumental or other traumatism, suppuration generally results. When the inflammation is slight it produces a sense of fullness and uneasiness in the perineum and rectum, with frequent desire to urinate; the urine is voided with difficulty, its passage being followed by a varying degree of relief. Defecation is generally painful. If resolution occurs these symptoms will disappear rapidly. If a urethritis was the exciting cause, the discharge associated with that condition will cease with the onset of the prostatitis, though it is sometimes replaced by a discharge of prostatic fluid.

If the inflammation becomes pronounced and the interstitial tissue between the glands and ducts becomes involved, the pain increases and becomes throbbing and lancinating or deep aching, with an augmented sense of fullness and soreness

in the rectum and perineum, aggravated by crossing the legs, pressure against the perineum, during defecation, urination, motion, etc. If the surgeon introduces his finger into the rectum, a hard, smooth, sensitive and painful mass pressing out its anterior wall will be found. In this stage there is frequent urging to stool with pain and tenesmus, an uneasy feeling at the neck of the bladder, and soreness from deep pressure above the symphysis pubis. The urine is voided in a small and unsatisfactory stream with terminal straining and sometimes a drop of blood. The pain is agonizing in character and is referred to the perineum, rectum, and anus, or it may shoot down the inner sides of the thighs, along the penis or into the glans penis. When acute suppurative prostatitis is due to pyogenic infection, independent of the extension of an acute urethritis there is generally little accompanying vesical irritation, though urinary obstruction may be an early symptom and continue until the abscess is evacuated. As the swelling increases, diminishing still further the calibre of the urethra, the urinary stream becomes gradually smaller until finally the urine is passed only in drops with great tenesmus; retention may occur. Violent erections are common. Hæmorrhoids are frequently developed. These symptoms are generally preceded or accompanied by fever which may have been ushered in by a chill, or there may be a succession of chills. The constitutional symptoms are most pronounced in the diffused and suppurative variety, and often induce depression and a typhoid state. If suppuration takes place (prostatic abscess), chills, fever and all the symptoms of pyæmic infection occur, with throbbing and lancinating pains in the perineal region with an increase of all local symptoms. When the swollen mass is palpated through the rectum it may feel boggy or fluctuate, though the tense prostatic capsule may completely obscure this diagnostic evidence. If the abscess is left to itself it usually opens into the urethra

spontaneously while straining during urination or defecation; it may be accidentally punctured by the catheter or sound, with sudden relief of the pain, retention of urine, etc. The abscess may discharge intermittently between the acts of micturition or only during urination. If the abscess is small it generally closes promptly; if large, on account of imperfect drainage, a granulating cavity, with infiltration of urine and an acute or chronic pyæmic condition may result. Sometimes it ruptures into the rectum or bladder.

Prognosis.—The duration of this disease varies from a few days to a month. When occurring in those otherwise healthy, the prognosis is good, the majority terminating without the formation of an abscess. If an abscess develops it may rupture spontaneously into the urethra, the rectum, the perineum, the space of Retzius, the sciatic foramen, the peritoneum, etc. Phlebitis is a common complication when the abscess is not properly treated. It may terminate fatally.

Treatment.—Rest in bed with slight elevation of the hips, hot sitz or general baths, hot fomentations to the perineum and the direct applications of heat or cold by rectal enemas, by means of the author's recto-prostatic double current tube, or a rectal psychophore. The bowels should be regulated, but continued catharsis should not be encouraged, though at the onset of the disease daily complete evacuation of the bowels is of benefit in relieving the portal circulation. If urinary retention occurs, catheterization, with continuous urinary drainage may be necessary. Catheterization must, however, if possible, be avoided, and if urethral injections are being used they must be discontinued. The diet should consist principally of broths, milk, matzoon, koumyss, rice, stale bread, etc. Alcohol must be forbidden. If an abscess develops or the perineal tissues become indurated or swell an incision should be made through the perineum. Operative interference is often advisable before fluctuation can be discovered.

Conservatism is out of place and procrastination is to be condemned. The pus cavity can be easily located with the Guiteras grooved trocar and canula (Fig. 27), which is inserted through the median raphé of the perineum about one inch anterior to the anus; when, guided by the index finger of the left hand in the rectum, it is pushed forward until the abscess is reached; the opening is enlarged with a long, straight, narrow bistoury which is introduced along the groove upon the upper surface, of the grooved canula. The pus is then evacuated and the cavity surgically dressed. Injury to the rectal or urethral

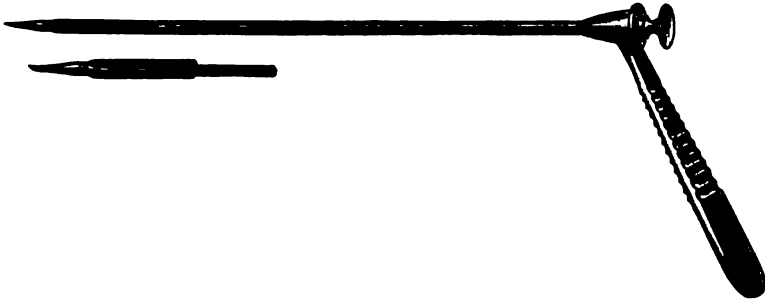


FIG. 27. Guiteras Grooved Trocar and Canula.

walls can be avoided by opening the abscess through the perineum, preventing the trouble and annoyance resulting from possible ischio-rectal fistula. If the abscess points toward the rectum it may be opened at this point under strict antisepsis and the rectum kept aseptic by frequent douching. If it opens spontaneously into the urethra, as soon as the acute symptoms subside, the pus cavity must be irrigated twice daily through the urethra with an antiseptic solution, such as a saturated aqueous solution of Boric acid, Nitrate of silver, 1-2000, or Electrozone, one part to seven, attention being paid to emptying the pus cavity by pressure of the finger in the rectum before, during and after each irrigation. The local treat-

ment must be continued until the cavity is completely closed, as there is always a tendency to recurrence.

Aconite, Belladonna, Gelsemium or Pulsatilla often give decided relief, and if they do not stop the progress of the inflammation they limit its extent. When suppuration is threatened, Hepar sulphur or Echinacea are beneficial, while after the evacuation of the pus, healing is facilitated by the administration of Silicea, Hecla lava, Sulphur, etc.

Acute Peri-Prostatitis (Acute Peri-Prostatic Abscess).—Peri-prostatic cellulitis or abscess may be caused by extension of some inflammatory condition or rupture of an abscess in the adjacent prostate or seminal vesicle. It may be a complication of cancer or tuberculosis of these organs or originate in a suppurating lymphatic gland lying in the post-prostatic space. Sometimes it is caused by wounds through the rectum.

Clinical History.—This condition commences as a general diffuse inflammatory oedema in the meshes of the connective tissue surrounding the prostate, but soon degenerates into a suppurating mass. The outline of the prostate as appreciated by the rectal touch soon becomes largely defaced, giving place to a boggy or fluctuating mass. The general manifestations differ little from those of a prostatic abscess, though usually they are not so pronounced, particularly the urinary symptoms.

The abscess burrows along the line of the least resistance. It may travel forward into the perineum and the ischio-rectal fossa, opening into the urethra, the rectum, or through the perineum, forming fistulæ of various kinds which rarely close spontaneously and if left to themselves may remain a menace to comfort and health. If the pus burrows forward into the perineum it may dissect up the corpus cavernosum or, traveling through the obturator foramen, follow the connective tissue about the spermatic cord into the space of Retzius and finally appear upon the abdomen. It may burrow through

the posterior vesico-rectal cul-de-sac into the peritoneal cavity or traveling around the bladder mount in the sheath of the rectus muscle to the front of the abdomen.

Treatment.—As soon as discovered, the pus cavity must be opened by the perineal or other appropriate route and surgical drainage and dressings instituted as outlined under acute prostatitis.

Chronic Peri-Prostatitis.—This condition gives rise to no special general symptom. It is usually due to an extension of some inflammatory condition of the prostate to the connective tissue surrounding that gland, resulting in a considerable mass of thickened inflammatory tissue which might be mistaken for a cancerous or other foreign growth.

Treatment.—This should be along lines best adapted to the exciting cause.

Chronic Parenchymatous Prostatitis.—**Etiology.**—The predisposing causes include all conditions which produce prostatic hyperæmia, *e. g.*, sexual excesses, unnatural sexual acts, as well as mental sexual incontinence; irritating deep urethral injections and instrumentations. It may be conditioned by hæmorrhoids, frequent defecation, chronic constipation, fissure of the anus, pruritus ani, highly concentrated urine or that surcharged with some chemical irritant; exposure to dampness or cold, dietetic or alcoholic excesses, a gouty, rheumatic, or tubercular diathesis, the presence of a vesical or prostatic calculus, hypertrophied prostate, etc. The exciting cause is generally infection. Usually it is due to the extension of, or is a sequel to a simple or gonorrhœal urethritis, a stricture or a traumatism of the urethra or a vesical inflammation.

Pathological Anatomy.—The prostate may in size be normal, swollen or diminished. Enlargement is caused by the infiltration of the glandular structure and ducts of the organ with lymph or pus. On section the prostatic tissue appears spotted, red, somewhat boggy, and contains more than the

normal amount of fluid, and if pressure is applied it may exude in considerable quantity a fluid of a dirty red color. At a later period there will be present, here and there, small collection of pus. The mucous surface of the sinuses of the prostate and the mucous follicles become attenuated, thinned and vascular and their ducts somewhat dilated. When the disease has been caused by a stricture of the urethra the coats of the prostatic sinuses are usually diminished in thickness and the mouths are generally open and pouchy. The mucous membrane may be coated with organized lymph, giving it a roughened and opaque appearance. The ducts are often distended with pus, the gland showing a grayish tinge after death. Sometimes pus cavities of considerable size are present and connect by a channel with the urethra.

In the interstitial form there is a cellular infiltration of the glandular elements which may be transformed into fibrous tissue and finally contract, causing atrophy of the organ.

Clinical History.—This varies greatly with the exciting cause and the temperament, age and habits of the patient. When of the glandular variety and general in character there may be few symptomatic manifestations. Usually it is the sequel of an acute infection of the prostate, a chronic spermato-cystitis or a prostatic hypertrophy. Pain is a common symptom. It may be referred to the sacrum, the anus, the perineum, the inguinal region, sometimes to the neck of the bladder, along the spermatic cord, down the urethra or to the end of the glans penis. The pain is usually increased by physical exercise. Often there is a troublesome tickling sensation in the urethra, as though a drop of fluid were being expelled; a sense of weight and fullness in the region of the prostate or the neck of the bladder, an itching and titillation in the urethra, perineum and rectum, or a voluptuous sensation in the perineum. Derangements of sexual function are often pronounced, *i. e.*, frequent and painful erections or imperfect and prema-

ture emissions generally being the first manifestations which call attention to the developing condition. Later the sexual strength becomes impaired. Nocturnal emissions are frequent and sometimes bloody.

Micturition is increased in frequency. The calls may occur every half hour. It may not be troublesome. Often there is a little burning or tingling as the urine passes over the prostatic portion of the urethra, with a slight twinge at the end of the act and a possible terminal hæmaturia. The urinary flow is sometimes retarded; the urine may be voided only in drops. The pain and frequency of micturition are increased by standing and somewhat by crossing the legs.

The urine is of a low specific gravity, pale in color, alkaline or feebly acid in reaction, cloudy, holding in suspension small masses of muco-pus, which are particularly noticeable in the first ounce passed. If after douching the anterior urethra with a Boric acid or Salt solution to thoroughly cleanse it the urine is voided in two portions for examination, the first will contain mucus, particularly the commatacks, in abundance, while the second may be clear. This test cannot always be relied upon, as the compressor urethræ muscle may, between the acts of micturition, be tightly or spasmodically contracted, causing the prostatic discharge to back up and empty into the bladder, and thus becoming mixed with the entire urine. If the urine is permitted to stand for a few hours an iridescent pedicle will generally form upon its surface.

In this disease, when the patient is under forty-five and the prostate is examined through the rectum, it may appear enlarged, encroaching on the rectal space and be very sensitive. It may be swollen and smooth. Often it is quite nodular. It may seem small in size owing to the changes which have followed a chronic fibrous inflammation. If pressure be applied by the finger tip through the rectal wall upon a prostate undergoing parenchymatous inflammation, a

varying quantity of prostatic fluid will be discharged from the over-distended gland into the prostatic urethra. The same prostatic discharge may occur when straining at stool, during muscular exercise or even without apparent cause. This secretion varies greatly in quantity and may be so profuse as to soil the linen, etc. It is composed largely of mucus and granular phosphates, and is the product of the over-activity of the epithelial cells lining the prostatic tubules. Its character under the microscope will differentiate it from a gleet or spermatorrhœic discharge, the examination revealing pus, blood corpuscles, pear-shaped epithelium, amyloid bodies, fatty debris—the percentage of fat granules and amyloid bodies are decreased—prostatic concretions, granular phosphates, triple phosphates, oxalate of lime, etc.

Headache and muscular pain are of frequent occurrence, with loss of appetite, flesh and strength. With the majority, mental and physical incapacity gradually develop. They become nervous, hysterical, weak, feverish and anæmic; it is with the utmost difficulty that they can be convinced they are not suffering from spermatorrhœa when they see the discharge from the urethra or notice after a hard stool, a suspicious moisture at the meatus even when the microscope demonstrates the absence of spermatozoa; in others the mental symptoms are entirely absent.

Diagnosis.—This condition may be confused with tubercular prostatitis, but it is more chronic than the latter, although it has about the same history. The absence of tubercular lesions elsewhere and the microscopical examination of the discharge will be of much assistance. The age of the individual generally counts against hypertrophy of the prostate, as that condition rarely occurs before the fifty-fifth to the fifty-eighth year.

Prognosis.—Fidelity and perseverance in treatment usually gives satisfactory results, though it is rare that a perfect cure

is consummated. The young man always responds more rapidly than one advanced in years.

Treatment.—A cure may reasonably be expected if the cause can be eradicated. If this cannot be discovered or removed, palliation is all that can reasonably be expected. The diet must be plain, nourishing and not too stimulating. Condiments, salt food, coffee, tomatoes and asparagus must always be forbidden. Alcohol must be prohibited. Moderation in all things, with out-door exercise, removal to the seaside or the mountains, and rest in the recumbent position when possible should be advised. Sexual intercourse must be interdicted and carnal thoughts avoided. In the married, however, sexual relations may be allowed under proper restrictions.

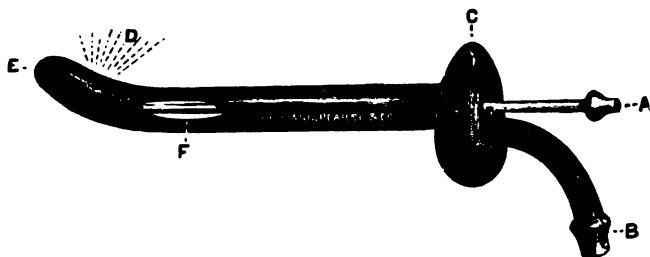


FIG. 28.—Recto-Prostatic Irrigator.

The bowels should be evacuated daily by enemas. Cold sponge baths in the morning and hot sitz baths, of ten to fifteen minutes' duration, at bedtime should not be forgotten. Daily rectal irrigation with two quarts of a normal salt solution at a temperature of 105° to 115° Fahr., administered through the author's rectal irrigator (Fig. 28), or cold, applied by means of the rectal psychophore, are beneficial. They deplete the parts and relieve the deep-seated congestion.

Massage of the prostate is of the utmost importance. It can be given most satisfactorily in the position recommended in the treatment of chronic spermato-cystitis, *i. e.*, in the knee

and elbow position, or in the dorsal posture with the limbs slightly flexed. After the patient is placed in the selected position, the first or middle finger of the operator, protected by a long rubber finger tip and anointed with vaseline, is introduced into the rectum. If the finger tip, which not only protects the finger from becoming soiled, etc., but prevents any possible injury to the mucous membrane of the rectum by a rough finger nail, cannot be procured, the finger and especially the nail should be lubricated and protected with soap before it is introduced. The diseased gland is massaged with the tip of the finger from right to left and *vice versa*, pressure being made towards the symphysis pubis; the gland should also be massaged forward and backward. The treatment should be continued from two to five minutes; it may be repeated with advantage every fifth day.

The passage of full-sized urethral sounds and local treatment of the prostatic urethra are very efficacious. The sound must be introduced with the utmost gentleness. It may be arrested by the compressor urethræ, which is usually in a state of spasmodic contraction causing one of the unpleasant symptoms which often arise in the disease. If stricture of the anterior urethra is present a preparatory urethrotomy will be necessary. Sometimes the author's or the Kollmann antero-posterior urethral dilator can be used to advantage. Some attribute the relief to the action of the cold and, going further, apply cold for five minutes to the prostatic urethra by means of a hollow sound—urethral psychophore. Others claim the relief is due to the dilatation which forces the blood out of the organ and empties some of the numerous follicles. The sound, when used, should be passed every five to eight days. Faradism, using a long coil and a secondary current, is sometimes efficacious.

When the mucous membrane of the prostatic urethra is seriously affected, as shown by the presence in the urine of round

masses from the lacunæ or crypts of the glands, irrigation of the prostatic urethra with some of the silver or Permanganate of potash solutions, or instillations by means of the Bang's syringe sound of twenty to thirty drops of a 10 to 20 per cent. solution of Argyrol, two or three drops of a Nitrate of silver solution, one to ten grains to the ounce of distilled water or ten drops of a solution composed of tincture of Iodine, Carbolic acid and Boroglyceride, equal parts will be required. The urethra can be dilated and then irrigated with a solution of Nitrate of silver, 1-20,000. Instillations into the deep urethra must not be repeated more frequently than once in five days. The non-infectious variety is often relieved by the Bottini cauterization of the prostatic urethra. Occasionally an external urethrotomy with bladder drainage through the perineum for one or two weeks will be necessary to a cure. Some authorities advise the application of a mild Cantharidal collodion to the perineum, painting one side up to the median raphé; when this side has healed the opposite is painted in like manner, the scrotum and anus being protected by absorbent cotton. Rectal suppositories containing one and a half or two grains of Iodoform or Ichthyol may give much relief.

The remedies symptomatically indicated and useful in the catarrhal conditions of the prostate are as follows:

Carboneum sulphuratum.—Cramping pains at the neck of the bladder during micturition, extending to the urethra, with similar pains in anus and rectum; urging to urinate, with burning in urethra and neck of bladder. Inability to retain urine even for an hour. Urination painful, slow; urine bloody, turbid or pale, containing an abundance of carbonates and phosphates. Nightly erections with emissions. Ejaculation short, incomplete. Impotence. Shrunken, painful scrotum. Testes small, diminished, sensitive to pressure.

Ferrum picrate.—Incomplete evacuation of bladder; cutting

pain referred to neck of bladder during micturition. **Frequent** desire to urinate, especially at night, interfering greatly **with** sleep.

Gelsemium.—Sensation when urinating as if urine were **not** entirely voided. Stream, intermittent, or accompanied by agreeable sensation in urethra. Urine milky, turbid, **limpid**. This remedy is frequently indicated not only in chronic catarrhal prostatitis, but is especially beneficial in the acute form of the disease.

Hepar sulphur.—Micturition impeded. Can never completely finish the act, some urine remaining in the bladder. Urine dripping vertically from end of penis. Discharge of prostatic fluid during stool. This medical agent is often useful in commencing suppuration following either acute catarrhal prostatitis, or when chronic, involving the prostatic lobules and peri-prostatic tissue.

Kali bichromicum.—Frequent micturition with burning along the urethra after the act; burning pain in the bulbous and navicular portions of the urethra during urination and afterward; constricting pains at the root of the penis on awakening in the morning. Sticking pain in the prostatic region, present on waking. Discharge of prostatic fluid with stool.

Magnesium muriaticum.—Often indicated in the early stages of catarrhal prostatitis for the violent erections. Desire if not satisfied is followed by pain in testes, spermatic cord and small of back. Frequent emissions. Micturition only possible by exertion of abdominal muscles; it may often be necessary to press upon the abdomen with the hands to facilitate the act. Frequent micturition at night, accompanied by burning in the urethra and frequent erections. Involuntary urination when walking but on attempting to urinate no urine can be voided.

Mesereum.—Urination frequently followed by a few drops of blood. Painful straining and drawing in the anus and

perineum often extending down the urethra. Between acts of micturition, discharge of watery mucus, or tenacious, transparent fluid. Stinging, crawling, pains in the forepart of the urethra. Chronic prostatitis accompanied by balano-posthitis. Troubled greatly with erections during the day, violent in the evening with yawning and sleeplessness. Testes painful on pressure. Drawing, stitch-like pains in the spermatic cord. After emission or sexual excitement, crawling sensation over whole body.

Natrum carbonicum.—Frequent desire to urinate, the desire persisting after the act is completed. Voiding the last few drops is accompanied by cutting pains in the bladder with discharge of mucus. Frequent micturition at night. Nocturnal emission, even immediately after coitus. Discharge of prostatic fluid during stool or during voiding of urine. Frequent erections during the day, often violent and painful. Nocturnal pollutions followed next day by fretfulness, discontent, etc. Priapism toward morning. Emission without desire. Excessive irritability of the genital organs.

Natrum muriaticum.—Burning, cutting pains in the urethra toward end of act of micturition, followed by moisture. Discharge of prostatic fluid on friction of clothes, without excitement or erection. Constant moisture at the meatus. Drawing pains in the spermatic cord. Stitch-like, pinching pains transversely at the neck of the bladder when walking and after urination, followed by discharge of a purulent, yellowish fluid soiling the linen. May produce itching in the urethra. Voluptuous irritation when sitting, relieved by walking. Emissions delayed or absent during coitus. Ejaculation too early. Emission with morning stool. Great weakness after morning emission.

Phosphorus.—Urination difficult, accompanied by burning sensation. Urine covered with sediment or fatty filament;

whely-like sediment. Discharge of seminal fluid during **stool**, after micturition and on friction of clothes. Genital organs relaxed with moisture at meatus. Often a yellowish **stain** from this moisture. Cutting, sticking pains in anus and **perineum** when at stool or urinating. Uncontrollable sexual desire and excitability. Erotomania. This remedy is **indicated** not only in satyriasis, but is frequently required in **impotence** and other sexual disorders. Impotence from chastity is also included under this head, also erethism from congestion of the prostate and veru montanum.

Sabal serrulata.—Throbbing and cutting pains at neck of bladder often accompanied by sharp, stitching pains in the spermatic cord. Retention of urine. Depression of spirits. Dribbling of urine. Weak sexual power. Acts especially upon the generative organs, testicles and prostate. Increased desire to urinate during the day and night, due to congestion of the prostate. Especially indicated when despondency predominates.

Selenium.—Sensation as of a biting drop forcing its way out of the urethra. Dribbling of prostatic fluid after urination, on walking and on sitting. Discharge of sticky, watery substance, without odor, during stool. Erections slight and incomplete. Emissions premature. Impotence with lascivious thoughts. Pollutions followed by irritability, mental confusion, weakness, etc.

Atrophy of the Prostate.—This condition is due to wasting of the glandular tissue, the muscular and fibrinous being but little changed. In congenital eunuchs it is said that the prostate fails to develop. There is also an idiopathic failure of development. True atrophy of the prostate, following castration, is now denied. Diminution in the size of the prostate often follows abscess; it may be due to the continual pressure from a calculus. As yet no authentic symptomatic clinical history is recognized.

Hypertrophy of the Prostate.—Etiology.—No one of the many explanations of the origins of this condition has been universally accepted. The principal supposed causes of prostatic hypertrophy are perverted sexual acts, habitual sensual indulgence and unchaste thoughts, neglected simple or bacterial posterior urethral inflammations, abnormal functional activity of the testes, obstructions and structural changes in the urethral canal. It seems to occur more frequently in those who have lived exemplary and sedentary lives, particularly if they have been neglectful of the calls to evacuate the bladder; it is relatively uncommon among those who have indulged in alcoholic and sexual excesses. It rarely occurs before the forty-fifth and usually is not discovered before the sixtieth year. Individual cases—previous to this time of life—have been reported by Mudd at five and twenty-seven years; Stretton, at nineteen; Englisch, at twenty-five; Thompson, at thirty-seven, etc.

Enlargement of the prostate, varying from a slight rotundity to the size of an orange, occurs in one-third of all men over fifty. About one in eight has extensive enlargement and only one in five of these suffers from urinary inconvenience. The Japanese are not afflicted; it is also rare among those born in China and India.

Pathological Anatomy.—The morbid changes in hypertrophy of the prostate consist of a non-inflammatory local or general overgrowth of the component cellular elements of the organ. There may be a general increase in all the normal tissues, or any one of the structural elements may be developed exclusively or in a degree far beyond the other. If the connective tissue elements are particularly and preëminently proliferated, the overgrowth will occur slowly, be hard and firm and of moderate dimensions; when the muscular and glandular are the predominating elements, the hypertrophy increases rapidly, the prostate becomes excessively enlarged and

to the rectal touch appears somewhat compressible and **elastic**. Sometimes, on section of a hypertrophied prostate, **numerous** discrete tumors, varying in size from one-quarter to one **inch** in diameter, appear upon the cut surface. One large tumor



FIG. 29.—Excessive Enlargement of the Lateral Prostatic Lobes of the Prostate. (Bransford Lewis.)

may contain several small ones; they can generally be easily enucleated, leaving a smooth-walled cavity; when this variety of pathological overgrowth occurs the organ becomes bosse-

lated. This constitutes the so-called adenoid hypertrophy. The growth may be soft and glandular, or hard and fibrous.

A prostate weighing over six drachms may be considered enlarged. The overgrowth involves both lateral lobes and the median portion in 65 per cent., and is more prominent in either the right or left lobe in 84 per cent. It may be confined to the median portion. The overgrowth may be limited to the posterior isthmus; it may project backward into the bladder, into the urethra, or appear as a pedunculated mass or collar at the neck of the bladder. While the contour of prostatic enlargement is of interest in selecting the best method of surgical relief, the symptoms which it causes depend upon the changes produced by the bulging of the posterior surface of the gland, the elevation of the urethral orifice at the neck of the bladder, the projection of one or more pedunculated overgrowths into the vesical cavity, which, from their location, act as a ball valve over the urethral inlet and particularly upon the change in the length, direction and size of the prostatic urethra. Other configurations are often presented by this non-inflammatory prostatic growth which are unimportant and too numerous to mention (Fig. 29).

In a large proportion of those afflicted with prostatic hypertrophy the lateral lobes of the organ only are involved (Fig. 30); symptomatic evidence of its presence may be wanting until on examination per rectum the finger of the surgeon encounters a hardened mass, the top of which possibly cannot be reached. This mass is generally somewhat globular and often furrowed down the centre; one side may show more evidence of enlargement than the other. In every form of prostatic hypertrophy there is some change in the relative position of the urethral outlet of the bladder, which in a normal condition corresponds to the lowest point of the bladder. When the hypertrophy attacks only the lateral lobes the overgrowth may lift the fold of mucous membrane

at the urethral orifice and, by pushing the urethra before it, produce what is known as a bar at the neck of the bladder. A similar condition may also be due to a contracture of a bundle of muscular fibres at the neck of the bladder caused by a chronic posterior urethritis.



FIG. 30.—Moderate Enlargement of Both Lateral Lobes of the Prostate. No Median Enlargement. (Watson-Lewis.)

As the vesical surface of the gland is not encapsulated, the enlargement often rises—in the line of the least resistance—

from the floor of the posterior urethra or the so-called posterior or middle lobe and projects upward like an extended lip into the vesicle cavity, changing the normal outlet of the bladder into a crescentic opening with its convexity directed upward ; it may extend backward into the bladder, shaped like a large



FIG. 31.—Bi-lateral Enlargement of the Prostate. Lengthening of the Prostatic Urethra with Obstructions from a Pedunculated Intra-vesical Growth. (Bransford Lewis.)

pear (Fig. 31) or be slightly pedunculated. Jores states that in prostatic hypertrophy involving the so-called third or middle lobe, the overgrowth begins in the accessory prostate glands

which lie just beneath the mucous membrane at the **urethral** orifice, which, as they enlarge, project slightly into the **bladder**. This special glandular hypertrophy usually forms the **apex** of the overgrowth of the so-called middle lobe. The **accessory** prostatic glands are involved to a varying degree in 81 per cent. of all prostatic hypertrophies. Distortion of the prostatic **urethra** depends upon the character and location of the prostatic overgrowth. When the growth extends upward and backward into the bladder (Fig. 31), the urethra is proportionately **lengthened**, greatly impeding the evacuation of the urine. When the lateral lobes become enlarged the urethra is correspondingly dilated and is changed in conformation to a vertical slit, tortuous from side to side. Obstruction in the urethra may also be due to the overgrowth of one or more of the accessory prostatic glands which lie beneath the mucous membrane of the floor of the prostatic urethra (Fig. 32). The lengthening of the urethra by the overgrowth of the prostate as it enlarges upward and backward increases the radius of the urethral curve, and prevents the introduction of the ordinary Thompson curved silver catheter, one made on a special or prostatic curve being required. The prostatic enlargement, by its obstruction to the exit of the urine, affects secondarily the urinary tract as follows: If the obstruction develops slowly, the bladder wall undergoes a corresponding compensatory muscular hypertrophy; it may become one-half an inch or more in thickness, and show bands of muscular tissue projecting into the bladder cavity which give it a trabeculated appearance, and at the same time the capacity of the viscus is reduced. If the growth is sufficiently slow the walls of the ureters and pelvis of the kidney may be correspondingly thickened; in time, however, an atonic condition, with dilatation of the ureters and subsequent hydronephrosis, will ensue. If the obstruction to the exit of the urine develops rapidly, overdistension of the bladder occurs and its walls become

thinned and atonied ; but even in the event of an early **compensatory** hypertrophy of the bladder wall, after a certain period, its **expulsive** power becomes insufficient or ceases and **dilatation** and atony follow, often with much sacculation of the vesical



FIG. 32.—Multiple Prostatic Adenomata Projecting into the Prostatic Urethra. (Bransford Lewis.)

wall, the sacculated portion being composed of mucous membrane and peritoneum only. With this atonic condition the blood vessels become thinned, dilated and over-stretched, and,

in consequence, imperfect circulation and further deterioration results from deficient blood supply. As a natural sequence of these changes in the prostate and vesical wall, the bladder is unable to completely evacuate itself, and urine, varying in amount from half a drachm to a pint or more, remains after each micturition. This is called residual urine. The gradual increase in the volume of residual urine is due not only to these changes, but to the weight of the residual urine itself and the strain upon the weakened bladder walls from its unsuccessful efforts to evacuate the bladder contents. These influences force the over-distended bladder down into the rectal space, and forms what is called the post-prostatic vesical space, which extends downward and backward behind the prostate. A space may form in a similar manner anteriorly.

The dam of prostatic mucous membrane behind the vesical exit and the hypertrophied posterior lip of the prostate not only interfere with the natural discharge of urine during the act of micturition, but prevent the complete emptying of the bladder and favor the development of the following pathological conditions: Chronic cystitis, cystic calculi, dilatation of the ureters, pyelitis, pyelo-nephritis, nephritis, etc.

Clinical History.—As obstructive prostatic hypertrophy advances, micturition becomes more frequent, accompanied with the desire to evacuate the bladder once or several times at night. Nocturnal frequency of the urination is considered almost pathognomonic of prostatic hypertrophy. The frequency of micturition during the early period is due largely to congestion of the prostatic urethra and bladder; later to the residual urine, which varies in proportion to the degree of prostatic obstruction and the general failure of the vital forces. As the amount of residual urine increases, atrophy and degeneration of the bladder wall take place. As the calls to micturate increase in frequency, the force and volume of the stream and the quantity of urine voided

diminish, and at the end of the act, dribbling of urine occurs. **When** micturition seems imperative it is often necessary to **wait** a short time for the flow of urine to begin ; at first the **stream** comes slowly and is deficient in force and volume, but if pressure is omitted it gradually increases in force, or the main volume may be projected forward while at the same time some of the urine dribbles or drops from the end of the **penis**.

On straining, the stream will grow smaller and may even stop, the effort being accompanied by some uneasiness and pain in the hypogastrium, perineum or rectum. The degree of pain accompanying micturition varies with the amount of congestion existing along the urogenital tract. The act of micturition may close with the dribbling of a few drops of urine, or the stream slowly stop, but not with the sharp contraction usually in the healthy man. If infection of the uropoietic system with subsequent cystitis and posterior urethritis does not ensue, the frequency of urination, etc., may be the only symptoms until incontinence of retention, with passive dribbling of urine from the meatus, develops, which is nature's effort to relieve a greatly over-distended bladder. The urine may be passed in a thin, small stream or in drops. Dribbling of urine may be due to three different causes, the most frequent being from an overflow of a bladder which has been filled to its utmost capacity. The elasticity of the bladder wall overcoming the obstruction, the urine dribbles away at about the same rate at which it arrives from the kidneys—incontinence of retention. Occasionally there will be a persistent dribbling of urine with an empty bladder, the urethra admitting easily a full-sized catheter, the constant discharge of urine being due to some distortion of the urethral orifice, generally a lateral prostatic enlargement, which prevents complete closure of the sphincter and allows the urine to escape as it enters the bladder, a true urinary incontinence. In

others, however, with only a small volume of residual **urine**, there is a constant dribbling due to an abnormal irritability of the prostatic urethra, the little residual urine present **being** expelled every few moments in drops or spurts by muscular spasm; this condition should be considered an abnormal **frequency** of micturition and not an incontinence of retention.

If the prostatic obstruction is not removed and the urinary tract does not become infected, polyuria, excited by the back pressure upon the kidneys, will follow; the urine becomes profuse, the specific gravity drops to 1003 to 1006, it is deficient in urea and may contain albumen and casts, thus resembling the urine of interstitial nephritis. Urine secreted under pressure always contains some albumen. When there is a large amount of albumen in the urine of a prostatic it is generally derived from blood serum exuded from the weakened vessels of the associated diseased bladder, the exudation being excited by tenesmus, due to traumatism, catheterization or other instrumentation, or to a change in the inter-vesicular pressure produced by sudden evacuation of the residual urine. Blood does not often exist in sufficient amount to discolor the urine, though the presence of red blood corpuscles may be microscopically demonstrated. The deficient elimination of urea in time causes uræmic intoxication, gastric and intestinal disturbances, etc.

One afflicted with prostatic hypertrophy usually dates the commencement of his illness to the time when there was first noticed an increase in the calls to micturate, a dribbling of urine, a hæmaturia or an attack of acute urinary retention. Others are cognizant that there was a gradually increasing frequency of and difficulty in urinating. On careful inquiry it is usually discovered that for a number of months or years the sleep has been somewhat disturbed and on account of the sense of fulness in the bladder they have been obliged to rise once or twice during the night to micturate; that the inter-

vals between each act of urination during the day had been growing shorter, accompanied by a trifling sense of fulness or heaviness in the pelvic region or rectum, a slight dull pain behind the pubes, and a varying degree of priapism. As the volume of residual urine increases, the difficulty in the commencement of the act of micturition becomes more pronounced, the period between the acts still further shortens, the urine being voided in a small and dribbling stream, and micturition is not followed by the usual relief.

These and many other symptoms may be overlooked until, after a hearty meal, forced retention of urine, over-alcoholic stimulation, or chilling of the lower extremities, micturition suddenly becomes impossible, with resulting excruciating pain, etc.; if the acute urinary retention is not immediately relieved it may be followed by over-distension and atony of the walls of the bladder. The over-distension of the bladder finally pulls open the urethral outlet and there is an overflow with apparent relief, but the attack adds to the original lesion and the atony with the distressing symptoms of urinary obstruction and cystitis become greatly augmented. Finally complete distension of the bladder results with frequent calls to micturate during the day and enuresis at night.

Generally, long before incontinence of retention appears, as the result of infection, cystitis develops from septic instrumentation, etc., from without or within the system from the bacilli coli communi which have passed directly from the intestine, or indirectly through the kidney, into the bladder. With the advent of the cystitis, micturition becomes painful, the distress varying greatly in character. It may manifest itself as a tired, weak, aching, be lancinating or dull, continuous or intermittent, referred to the hypogastric region, perineum, scrotum, groins or inner sides of the thighs. Often there are associated sharp pains in the urethra and frequently in the glans penis, accompanied by much burning and strain-

ing, which if encouraged, cause frequent and sudden interruption of the stream. The urine becomes offensive, turbid, alkaline and may even be associated with a muco-purulent discharge from the urethra. As the disease progresses, the cystitis and urinary retention increase and the ureters, pelvis of the kidney and the kidneys themselves become involved. The walls of the bladder become thickened, sacculated, large calculi may form, and the urging to urinate grows more frequent and painful, with an excess of albumen in the urine. Sometimes the location of the prostatic hypertrophy makes it impossible to introduce a catheter into the bladder, and if sudden urinary retention occurs it can only be relieved by supra-pubic aspiration. As the disease advances the patient grows thin, haggard and feverish from the toxæmia, uræmia, sapræmia, etc. In the later stage of this disease, the severe tenesmus associated with micturition often causes hæmorrhoids, rectal prolapse, abdominal hernia, etc.

Sexual erethism is frequently present. It may become annoying and harassing. Priapism and nocturnal emissions are common. Sometimes there is a varying degree of sexual perversion with lust which is not satisfied by coitus; it may give rise to many excessive and unnatural practices. In others, who constitute the larger class of prostatics, the sexual desire slowly disappears and true impotence develops.

Diagnosis.—Prostatic hypertrophy should be suspected in men over fifty-five years of age who are annoyed by frequent calls to urinate at night, and especially in the early morning, when the act is begun with difficulty, the stream seeming full-sized but feeble and is followed by a sensation as if the bladder was not completely emptied, with accompanying disturbance of digestion. When under fifty years of age, and sometimes when over this period of life where there is no appreciable increase in the size of the prostate, and there is no pronounced increase in the length of the urethra,

a similar symptomatic condition probably indicates a constriction of the neck of the bladder and not a prostatic hypertrophy.

When urinary disorders occur in men over fifty years of age the hypogastric region should always be examined by palpation and percussion to ascertain whether there is any enlargement indicating an atonic or distended bladder, as the organ has sometimes attained the size of a foetal head before its over-distension has been discovered. The urine should be voided in the presence of the physician and the effect of forced expulsion noticed. If hypertrophy is present, the urinary stream will be diminished and the urine will dribble from the penis after the act.

To examine the prostate per rectum, the patient is placed in the dorsal position with the thighs flexed on the abdomen, or in the position recommended for examination of the seminal vesicles; the first or second finger protected by a rubber finger cot, etc., lubricated with soap or Vaseline, is introduced into the rectum and carried along the anterior rectal wall. The prostate being between the finger and the pubes, its form and characteristics can be easily determined; at the same time, by bi-manual manipulation, the size and condition of the bladder can be ascertained and often the amount of the residual urine estimated. The prostate, when normal, feels like a soft, somewhat indistinct body about the size of a horse-chestnut. When enlarged from lateral hypertrophy the tumefied mass which projects somewhat into the rectal space, is smooth and rounded in contour and somewhat unyielding to pressure, the elasticity varying with the relative amount of fibrous or muscular development; when of moderate size it is movable and not painful to touch or manipulation; the post-prostatic tissues are neither adherent or involved. The rectal examination must not, however, be considered absolute or final, as a prostatic overgrowth sufficient to cause complete

obstruction to the evacuation of the urine may occur without producing enlargement of the prostate in the rectal region. Prostatic hypertrophy sufficient to cause urinary obstruction cannot be demonstrated by rectal examination in over 66 per cent., while intra-vesical inspection always reveals its presence, the trabeculated bladder being pathognomonic. When the hypertrophy is confined to the median lobe there may be no positive evidence of enlargement gained by the rectal examination except the possible presence of a distended bladder. Enlargement of the prostate from a chronic catarrhal state is generally associated with a sclerotic condition of the tissues in the post-prostatic recto-vesical space, and adhesions may bind the mass to the rectal wall. Chronic inflammatory lesions of the prostate often terminate in its atrophy. In acute inflammation from any cause, the tumefaction is to pressure painful, feels hot and pulsating and there are accompanying febrile symptoms with a history of traumatism or infection. A cystic growth gives an elastic sensation to the touch. In malignant growths, at an early period, a bossilated appearance is often discovered, a single hard nodule the size of a small walnut being very suggestive; later there is often an inflammatory matting together of the parts, thickening of the pelvic floor, the involved lymphatics feeling like nodular cords in the recto-prostatic space. The prostatic enlargement must also be differentiated from the peri-vesicular thickening of a chronic seminal vesiculitis.

The increase in length of the urethra is estimated by the introduction into the bladder of a sterile catheter, the distance at which its eye enters the cavity is shown by the flow of the urine. Any increase over eight and one-half inches is generally due to a corresponding augmentation in the length of the prostatic urethra. The force of the urinary jet from the catheter will indicate the degree of tonicity of the bladder wall. Sometimes the contractile power of the bladder is so

much impaired that the urine will not flow until pressure is applied over the hypogastric region.

If, owing to hypertrophy of the posterior-median lobe or **dam**, catheterization is not easily accomplished, an original Thompson stone searcher may sometimes be successfully substituted. This instrument can also be utilized to interrogate the size of a vesical growth and the presence of a complicating vesical stone, which in advanced cases is often present, as well as to empty the bladder.

Sometimes, when a large prostatic hypertrophy exists as the eye of the catheter enters the prostatic urethra, *i. e.*, about nine inches from the meatus, there will be a flow of a few drops of urine from a sacculated space in this part of the urethra. This fact should be remembered to prevent the possible accumulation of urine in the bladder being overlooked owing to neglect to introduce the catheter a proper distance. The cystoscope is often useful in demonstrating vesical outgrowths, revealing the cause of the special obstruction and assisting in the selection of the best method of its removal.

As there is danger of infecting the bladder by the urethral methods of investigation, due precautions in their employment must always be observed. Catheterization should only be performed under strict aseptic methods, and in non-infected cases, which have not been previously catheterized, it is generally best, unless the patient is prepared to follow any advisable line of treatment, to omit this diagnostic method of investigation. The same rule applies to the infected bladder, which is in a quiescent state. But if the bladder is infected and instruments have been recently introduced, this method of diagnosis must not be neglected.

Urinary retention may also occur as the result of growths which only encroach upon or close the inner opening of the urethra; contraction of the posterior bundle of muscle fibres encircling the prostatic neck of the bladder; spermato-cystitis

when associated with considerable peri-vesicular thickening; malignant disease which can be recognized by rectal examination and its clinical history; pyelitis which by reflex action causes spasmodic closure of the neck of the bladder and consequent retention; this is, however, of temporary nature, disappearing with the eradication of the pyelitis; it may depend upon central or localized disease of the nervous system, which is characterized by its special manifestations. Prostatic abscess must not be forgotten, as it may occur spontaneously or be induced by some method of treatment advised. It may complicate hypertrophy of the prostate or be the source of a recent urinary retention.

Prognosis.—If proper care is advised and observed, relief can be promised in the milder forms of prostatic hypertrophy, and amelioration in the more serious; if allowed to go without attention, the most agonizing suffering may follow with ultimate fatal toxæmia. In itself prostatic hypertrophy is not a fatal malady, though if treatment is ill-advised, it will generally grow worse. The growth rarely undergoes malignant degeneration, though when left to itself it generally becomes progressively larger. The disease is characterized by periods of remission and exacerbation of the urinary symptoms, death occurring through urinary retention, kidney lesions, urinary toxæmia, septicæmia, etc., while others seem simply to die from exhaustion. As long as the disease can be controlled by palliation, a favorable prognosis, so far as immediate conditions are concerned, can always be given.

Until within recent years surgical relief of the clinical symptoms produced by a hypertrophied prostate was rarely attempted. Of late a variety of operative measures have been advocated and, at times, it has seemed from the reported results and the statistics of their sponsors that almost every case of prostatic hypertrophy which would submit to operation could be promised a cure, many forgetting that the

prostate cannot be operated upon with impunity ; that an old man with an acid cystitis and some pyelo-nephritis will not well stand surgical interference. When advocating prostatic operations it must never be forgotten that the elderly, while seemingly in good health and vigor, often succumb to embolus or an apoplexy and that their kidneys after years of toil are not always to be relied upon to stand the strain of an anæsthetic. With many the bladder is so contracted that the urinary function cannot be restored by any known operation, and with others the elements of general loss of vitality and septic conditions must be considered. At the same time, even when there is distinct evidence of heart, kidney and general systemic failure, surgical relief may give marvelous results, though the mortality may be high. It is conceded that of the various operations advocated the indirect methods only reduce the congestion of the prostate ; their best results have been in cases of sudden retention of the urine due to a congested condition ; that they afford no permanent relief, and oftentimes, even though at first beneficial, the improvement has been more than overbalanced by the nervous state produced, some patients becoming maniacal, others losing their mental balance or developing melancholia. Castration and vasectomy have been beneficial where there was present some pathological lesion of the testicle, but they have not proved the panacea that was expected, particularly when the testes were in a healthy state. These operations seem to relieve, temporarily, the congestion of the hypertrophied prostate. They do not, however, produce a radical cure, and postmortems have not revealed prostates atrophied from this cause. It is now believed that the relief which has followed these operations and which has been more pronounced from castration than from vasectomy has been due to depletion of the parts by a loss of blood, rest and careful treatment after the operation.

Castration and vasectomy are contra-indicated in **those** moribund from uræmia or sapræmia or prostrated by **sepsis** from suppuration of the prostate or kidneys. These **opera-**tions are also ill-advised when the bladder is over-distended **or** a vesical calculus is present, unless they are associated **with** other measures for their immediate relief. Ligation of **the** internal iliac arteries has been advocated and practised by Beer, but his success has not been such as to induce others to adopt his methods.

The Freudenberg modification of the Bottini cautery prostatotomy when advisable gives satisfactory and apparently permanent results. The Bottini operation is preferable when the connective tissue overgrowth is preëminent, particularly if there is considerable associated peri-prostatic thickening, when the prostatic neck of the bladder is obstructed by the so-called bar which elevates the internal opening of the urethra so that it is no longer, when the man stands erect, on the level with the trigone, when the obstruction is due to contraction of the posterior fibres of the prostate without apparent general enlargement of the organ, when surgical relief becomes necessary or a catheter life must be established, or when catheterization has been employed and found unsatisfactory. It must be acknowledged, however, that the operation is practically performed in the dark and fatal and serious accidents have occurred even with those most experienced, and particularly have annoying complications happened from want of drainage which is the only serious obstacle to this method of surgical relief. The Chetwood modification of this operation entirely obviates this objection. When there is a question as to the advisability of a Chetwood prostatotomy or a prostatectomy the former is to be preferred on account of the absence of shock, post-operative hæmorrhage and urethral spasm.

Prostatectomy is advisable when the muscular and glandu-

lar elements predominate or vesical growths of various forms project into the vesical space and obstruct the urinary exit (Fig. 33), and particularly if there is pronounced associated cystitis, vesical calculus, etc. The mortality in this form of surgical relief has been quite large, and resulting vesico-rectal



FIG. 33.—Excessive Enlargement of the Lateral and Medium Lobes of the Prostate, Favorable for Combined Supra-pubic and Perineal Prostatectomy. (Bransford-Lewis.)

fistulæ have been very common, statistics of reported cases being 2.7 per cent. The supra-pubic route takes preference when the growth is particularly large. Supra-pubic fistula

has followed in 1 per cent., peri-vesical infiltration in 16 per cent. and failure to relieve the urinary disorder has occurred in 7.6 per cent. The perineal route is generally advisable, though urinary incontinence has followed in 3.5 per cent. and failure to relieve the clinical symptoms in 7.4 per cent. The prognosis in prostatectomy is always grave when there is a complicating arterio-sclerosis with polyuria, cardiac hypertrophy, or there is an advanced atheromatous condition of the arteries.

Prostatectomies have often proved fatal even when performed by the most experienced operators. The mortality has always been and will continue extremely high on account of the nature of the condition calling for the operation, the cause of death being shock, suppression of urine, heart failure, sepsis, embolism and hæmorrhage. There is sometimes sloughing of the wound from systemic conditions or even from overdosing with Urotropin. Irritation and pain from the perineal drainage tube is sometimes so intense that its early removal is necessitated. It is generally removed from the fourth to the seventh day.

Incontinence of urine sometimes results from prostatectomies as well as from prostatotomies due to a too extensive division of the obstructing mass or a failure of the fibres of the internal sphincter to re-unite. Urinary incontinence occurring after operations upon the prostate generally ceases about four weeks after the operation. Recurrence of the symptoms of prostatic obstruction is always due to an incomplete operation. Cancerous degeneration may succeed operative relief for urinary retention due to prostatic hypertrophy. The operation is also sometimes followed by a varying degree of mental aberration. Watson in the *Annals of Surgery*, June, 1904, from an analysis of 2,627 reported cases of prostatic hypertrophy treated since 1890, presents the following statistics, all deaths occurring within two months from the com-

mencement of the specific method being attributed to the operation or treatment:

Method of Treatment.	Cases.	Deaths.	Mortality.
By catheterization:			
Rovsing	126	10	
Casper	51	3	
Watson	30	3	
	207	16	7.7 per cent.
Palliative operations—drainage	146	49	33.0 per cent.
Partial prostatectomies	160	22	12.5 per cent.
Total removals—perineal	530	33	6.2 per cent.
Total removals—supra-pubic	243	28	11.3 per cent.
Bottini	1086	69	6.3 per cent.
Castration	210	34	16.2 per cent.
Vasectomy	252	21	8.3 per cent.
	2627	256	

The mortality of the perineal and the Bottini operations is practically the same, and both are decidedly lower than that of any other method; so far, therefore, as this factor is concerned, the choice would fall to the former two, and they would stand upon equal terms.

The four factors—uræmia, sepsis, shock, and pulmonary complications—account for all but a very small number of deaths, and are therefore the only ones included in this analysis:

Bottini	27.0 per cent.	} Uræmia (or renal insufficiency).
Perineal operations	35.0 per cent.	
Supra-pubic operations	34.0 per cent.	
Bottini	52.0 per cent.	} Sepsis.
Perineal operations	17.8 per cent.	
Supra-pubic operations	8.6 per cent.	
Bottini	5.0 per cent.	} Shock.
Perineal operations	21.4 per cent.	
Supra-pubic operations	30.0 per cent.	
Bottini	8.0 per cent.	} Postoperative pulmonary complications.
Perineal operations	17.8 per cent.	
Supra-pubic operations	22.0 per cent.	

When the stage of palliation has passed and radical operative relief becomes necessary the lowest mortality with the

highest proportion of satisfactory results may be expected, delay diminishing the chances.

The object of the radical operation is the removal of the prostatic obstruction which impedes the natural exit of the urine, its removal constituting a surgical cure, but the relief given will vary with the bladder and kidney conditions present at the time of the operation. If the bladder is contracted and irritable, the frequency in the calls to micturate will undergo but little change, though relief from the pain and tenesmus will usually follow. If the bladder is dilated, it usually gains sufficient strength to empty itself at proper intervals. If sacculation has occurred, an occasional bladder douche may be necessary for comfort. If, however, sufficient general strength exists to stand the strain of the operation, an improvement is usually to be expected after the removal of the obstruction. When atony or contraction of the bladder and kidney lesions are not pronounced, the results will be perfectly satisfactory and the condition may be expected to continue to improve instead of growing worse. Without properly selected treatment the prognosis is always bad. The usual cause of death is acute cystitis from retention, urinary toxæmia or septicæmia.

Treatment.—The milder palliative methods should be first employed. Flannels must be worn all the year; exposure, particularly wetting of the feet, must be avoided; the clothing should be changed as the weather requires. If compelled to arise at night warm slippers should be worn. A mild, equable climate is of great advantage. The diet should be carefully regulated and all excesses avoided. The daily average amount of meat ingested must be reduced and its food value replaced by vegetables and cereals. Laxative food is generally taken to advantage, though fresh fruit should be eaten with caution as its acidity is often harmful. Pork, dried and salted meats, pastry, sweets and highly seasoned

foods, strawberries, asparagus, grape-fruit, cheese and tea must be interdicted. Coffee and cocoa in moderation can be allowed. Alcohol must be prescribed with caution ; whiskey, gin and white wine may be allowed in moderation, but beer and champagne should never be drunk. Plenty of milk, butter-milk and effervescing alkaline waters should be recommended. Over-exertion, horseback riding, bicycling and automobiling must be forbidden. Walking and golfing are most beneficial, and driving over smooth roads is not objectionable. Sexual excesses must be condemned. Moderation in all things must be the rule. These hygienic changes should be slowly brought about ; if undertaken at once the task may seem too great and the patient may refuse to coöperate, or soon becoming discouraged will refuse to continue.

The bladder should never be allowed to become over-distended. Straining during micturition should be avoided, even when the desire is urgent. Active diuretics should be administered with caution as they increase the volume of the urine and may cause over-distension of the bladder and retention. When the urine gives evidence of an associated cystitis, the remedies and antiseptics indicated for the chronic cystitis will be necessary and beneficial. Anodynes, to relieve the tenesmus, pain, etc., which often complicate urinary retention dependent upon the prostatic obstruction, are only permissible as palliatives until radical relief can be given. Of these, favorable results may be expected from fluid extract of Hyoscyamus, three to five drops, four times daily. A rectal suppository containing Morphia sulphate, one-third grain, and extract of Belladonna, one-eighth grain, or one containing Iodoform, two grains, and Ichthyol, four grains. Cocaine should never be used. When the urine is over-acid it should be neutralized by the administration of Citrate of potash in five or ten grain doses, Salol, etc., Vichy and the ingestion of soft spring water.

The late Dr. E. M. Hale suggested that the urinary retention could be largely overcome if the penis was grasped by the patient at the time of urination so as to obstruct the flow in the pendulous urethra and over-distend the membranous and prostatic portions of the canal. If then the pressure was suddenly released and the stream permitted to flow, the dam caused by the enlarged prostate would remain open and allow of a good sized stream, provided straining was avoided. By this simple procedure the necessity of the catheter or a surgical operation could for years be avoided.

When sudden retention of urine occurs, Bang's suggestion of placing the patient in bed with elevation of the pelvis, giving a high rectal enema, and irrigating the urethra with a hot aqueous solution of Boric acid, repeating in an hour or two if necessary, or a hot sitz bath with the frequent administration of Gelsemium, is sometimes followed by a spurt of urine and relief. Aconite, Hydrangea, Dulcamara, etc., may also be beneficial.

When these means fail, catheterization or aspiration of the bladder will be required to procure immediate relief. When there is atony of the bladder and retention of urine, catheterization or some surgical procedure will be necessary to make life endurable.

As the urinary obstruction increases and the desire to evacuate the bladder becomes more trouble some, with calls to micturate once or more at night, and there is some urinary pressure or tenesmus, the passage every fifth day of a full-sized conical steel sound or the local application to the prostatic urethra of a solution of Nitrate of silver (one to three grains to the ounce) with the Bang's syringe give very good results by relieving the congestion at the neck of the bladder. Occasionally, a better effect is produced when the introduction of the full-sized sound is followed by the silver solution. Sometimes the silver solution excites too much reaction, pain, etc.; when this hap-

pens a solution of Cupric sulphate, two to three grains to the ounce of water, may be substituted.

Catheterization.—If, on account of complete or sudden retention of urine from a prostatic obstruction or from vesical inefficiency, the frequency in the calls to micturate becomes annoying, evacuation of the urine with the catheter may be necessary. The selected catheter must be new, rendered thoroughly aseptic by some one of the approved methods of sterilization, well lubricated with sterile Vaseline, Lubraseptic or Lubrichrondin, and every aseptic precaution must be observed before it is introduced. The patient should be placed in the dorsal position previous to the introduction of the catheter. The urine must be evacuated very slowly, and not more rapidly than one ounce per minute at the first catheterization. When the bladder is completely emptied it should be carefully douched with an aqueous solution of Bichloride of mercury, 1-10,000, or Borolyptol, 1-15, at a temperature of 100° Fahr. After the organ is cleansed of pus, etc., about four ounces of the selected antiseptic solution should be injected into the bladder and allowed to remain. Failure to give proper attention to these points may result in shock, hæmaturia, etc. In removing the catheter the distal end must be closed by pressure to prevent leakage of urine along the urethra, which may, if the canal is eroded or diseased, cause infection and produce urethral fever. Some take kindly to catheter life and no ill effects occur even when proper attention is not given to its inauguration. This, however, is not the rule, though in time nearly all urethras become immune and require but little care to prevent infection. Were this not so few would survive a year's catheter life.

Sometimes the passage of a soft rubber catheter is impossible, yet a silver catheter with a long curve may succeed. It may be necessary to employ the Mercier catheter, with one or two elbows. This shaped catheter compels its point to fol-

low the roof of the canal and thus override the dam; an English catheter placed for a few moments in hot water and moulded to an exaggerated curve, cooled in ice water, and introduced rapidly without the stylet, will retain its form and often succeed in entering the bladder. A Tiemann velvet-eyed, soft rubber catheter of proper size can, by the insertion of the author's catheter staff, be made to assume any form desired, making its introduction easy, the removal of the staff leaving the flexible catheter in the bladder. (See catheterization and urinary retention.)

A catheter, however, should never be passed into the bladder except for justifiable surgical reasons. Its introduction, even when the urine is clear, may be attended with very unpleasant consequences. The number of daily catheterizations necessary will depend upon the amount of residual urine. It is never indicated when the quantity is less than two ounces. When there are from two to four ounces the contents of the bladder should be evacuated every evening to relieve the congestion in the region of the trigone and to allow of the full benefit attainable from local and systemic treatment. When the volume of residual urine increases to four to six ounces, diurnal symptoms generally appear, and the catheter should then be introduced morning and evening or as often as required by the degree of urinary retention. Catheterization must be cleanly, gently, infrequently and systematically performed and the correct technique observed. Irregularity in the time of catheterization is extremely harmful. When acute retention of the urine occurs from sudden closing of the urethra by a prostatic obstruction, or frequent catheterization is objectionable, painful or difficult, continuous catheterization for a few days may be beneficial and for the time give relief.

When catheterization becomes difficult, painful, frequently required and the urine shows evidence of bacterial infection in one whose business prevents him giving time to proper

palliative care, with rest and competent attendance, some one of the numerous surgical methods for relief will be necessary. In the event of an associated acute inflammatory invasion of the parts, when expense is no object and all exposures and indiscretions can be safely guarded against and the necessary attention given to the acute symptoms, surgical relief may be long postponed, though possibly at great disadvantage. If operative relief is refused and incontinence of retention is present or there is an irritable or contracted bladder, a proper urinary bag can be employed during the day, but the annoyance of wetting the bed at night must be accepted as inevitable. Dr. M. O. Terry says that teaspoonful doses of the following mixture,

℞ Ammonium chlor.,	℥ ss.
Fl. ext. Eupatorium pur.	
Fl. ext. Triticum repens,	aa ℥ j.
Emulsion of Acacia,	
Fl. ext. Corn silk,	aa ℥ iii.

taken in Vichy four times daily will for years obviate the necessity of surgical relief in prostatic hypertrophy.

When palliative treatment fails or it is evident that it will soon do so, surgical methods must be considered. Alexander summarizes as follows: Operative treatment is demanded—First, when there is complete or almost complete retention of urine due to prostatic outgrowths about the internal urethral orifice or projecting into the prostatic urethra, making the patient entirely dependent at all times upon the use of the catheter. The consequences cannot be doubtful in such cases and operation affords the only means of averting disaster. Second, when there is marked and continuous vesical irritability due to intra-vesical outgrowths, which cannot be allayed by the most careful catheterization and washing of the bladder. These patients usually suffer from frequent attacks of hæmaturia and cystitis. Third, when in spite of careful

catheterization the amount of residual urine is steadily and surely increasing, showing a gradual failure of the expulsive force in the bladder. Fourth, when catheterization is becoming more and more difficult in spite of every precaution and when it is frequently followed by hæmorrhages. Fifth, when catheterization, in spite of every precaution, is followed by attacks of cystitis. Sixth, in cases in which the patient cannot or will not use a catheter and take the necessary aseptic precautions to make its use of value.

Surgical relief may be divided into two classes, the palliative and the radical. The palliative is sometimes necessary for immediate relief or until such a time when the general system will permit of the more radical treatment. Palliative operations include supra-pubic, perineal and rectal aspiration of the bladder. Of these, the former is often employed to advantage; the perineal and rectal are rarely advisable or permissible. Cystotomy, with the object of forming a permanent fistula, also has three routes; they have passed largely into disuse. (*a.*) The supra-pubic, either by puncture or incision. In the first method the bladder is punctured by means of a trocar and canula, the canula being allowed to remain until a permanent canal is formed. This course is, however, uncertain in results and urinary infiltration is not uncommon. Supra-pubic incision and permanent drainage have the advantage of allowing inspection of the vesical cavity, but permanent drainage through a supra-pubic opening is rarely considered (by the patient) a success. It may relieve the pain and spasm, though in this it sometimes fails; the cystitis usually continues and, notwithstanding continuous proper bladder toilet, many distressing symptoms persist in addition to the soiling of the person and discomfort of the retaining apparatus. When an apparatus of this class is necessary, the one represented in Fig. 34, which was evolved by Mr. Donohue, having a retaining spring, will be found useful. (*b.*) Prostatic

puncture is objectionable because it does not afford proper drainage. (c.) Perineal section has been occasionally performed, but as permanent drainage by this route produces pronounced irritation of the bladder, it has been practically discarded.

The radical operative methods of relief are divided into two classes, *i. e.*, the indirect, which are designed to cause atrophy of the prostate by interfering with its nutrition, and, secondly, the direct, their object being either the removal of the obstructions, prostatotomy, or of the glands itself, prostatectomy.

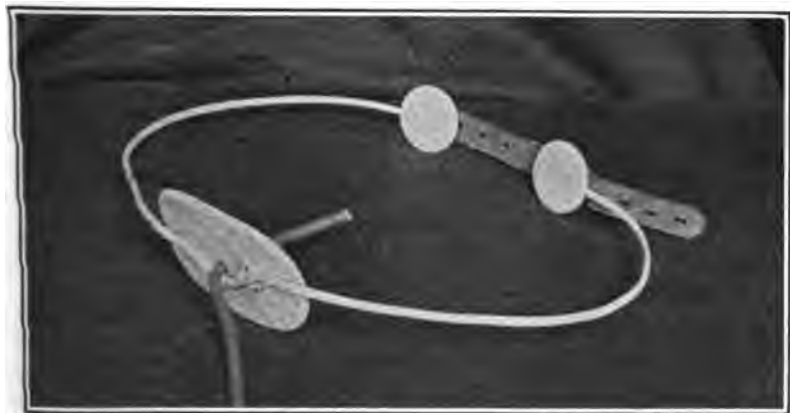


FIG. 34.—Apparatus for Supra-pubic Drainage.

The indirect operations, including ligation of the internal iliac arteries, emasculation, vasectomy, angio-neurectomy and injection of various substances into the testes, have all been strongly advocated. Statistics are not wanting to prove that they have been beneficial, but, from present indications, they can be considered as having served their purpose and are now only of interest from the standpoint of history.

When it is deemed advisable to perform a direct operation

upon the prostate, if it be a prostatotomy, the Bottini or the Chetwood modification should have the preference; if it be a prostatectomy, then one of the modifications of the supra-pubic or perineal routes must be considered.

Emasculatation.—In 1893, White stated that from his experience and studies he believed the removal of the testicles would be followed by atrophy of the prostate with relief of the distressing symptoms caused by its overgrowth, and that the death rate was smaller than that from prostatectomy. Many successful results have been reported. Castration is comparatively painless. It is not followed by the serious complications of the supra- and sub-pubic prostatic operations, though there is sometimes a sacrifice of the sexual power. Unilateral orchotomy has sometimes resulted very satisfactorily.

Vasectomy.—This operation has the vantage ground in causing no deformity, and is readily and quickly performed under cocaine anæsthesia. The most accessible point to attack the vas deferens is through the posterior surface of the scrotum. The vas deferens, being isolated from the surrounding veins, is held in place beneath the skin and tightly stretched over the finger, the integument is divided and the overlying tissue cut through, the vas separated and hooked out with a grooved director. Ligatures are applied directly above and below the director and the portion between removed, the cut ends cauterized with Carbolic acid, the wound closed, dusted with Iodoform and properly dressed.

The nerve and blood supply of the prostate and testicles are of different origin; the relation of the testicles to the prostate is without question only one of function. Emasculation discontinues the functional sexual life, and also eliminates from the system the power which the testes have of giving to man his virility, just as the ovaries give the feminine characteristics to the female. This being true, the re-

section of the vas deferens, should give all the relief which would follow a castration, while it possesses none of its disadvantages.

Prostatotomy.—In the past, when mild methods failed to relieve the urinary obstruction due to a prostatic overgrowth,



FIG. 35.—Model of Schneider Case. 1901. Showing Groove made by the Bottini Instrument through Collar of Fibro-mucoid Tissue about Urethral Orifice. (Bransford-Lewis.)

the only hope of making life endurable was by a median or lateral prostatotomy, or a supra-pubic cystotomy with permanent drainage, which, while relieving the pain and urinary

retention, produce inconvenience and annoyance, possibly resulting in urinary abscesses, sinuses, etc.

While these various operative methods are of historical interest, they are rarely employed at this time, being replaced by the galvano-caustic prostatotomy or a selected prostatectomy.

Galvano-Caustic Prostatotomy.—The Bottini galvano-caustic prostatotomy consists in burning a series of grooves along the prostatic urethra in the obstructing portion of the overgrown prostatic tissues (Fig. 35). The operation may be performed under local Cocaine or Eucaine or general anaesthesia. The results are good not only at the time of operation, but become progressively better. The incontinence of urinary retention is generally relieved at once and is usually followed by an improvement in the constitutional condition.

The Bottini galvano-cautery incisor as modified by Freudenberg (Fig. 36) is made up of a shaft shaped like a lithotrite, provided with a platino-iridium blade or male shaft, which is directly connected with a storage battery (the Willy Meyer battery, Fig. 37), or with a street alternating current of one hundred and four volts by means of the cautery transformer controlled by an ampère-meter. When the instrument is closed, the male blade is concealed within the female shaft. The platino-iridium blade is exposed by turning the wheel attached to the archimedeian screw to the right, the scale on the exposed male shaft behind the wheel exactly gauging the length the blade is exposed, *i. e.*, the length of the groove



FIG. 36.—Bottini Galvano-Cautery Incisor.

made in the prostatic tissue. The instrument is provided with a cooling apparatus, which runs through the entire length of the female shaft, crossing at the beak and returning on the opposite side of the instrument. The inlet and outlet of the water canal are directed outward and downward from the handle of the female shaft, one being connected by means of a piece of rubber tubing with a reservoir containing at least two quarts of iced water, situated five feet above the operative sphere. A short piece of tubing conveys the water from the outlet of the instrument to a receiver.



FIG. 37.—Willy-Meyers Storage Battery.

Before commencing the operation the instrument is connected, the cautery blade tested on a piece of moist gauze to ascertain that it will carry the proper ampère of electricity and that the water apparatus is in working order. The patient is placed in the lithotomy position, a cystoscopic examination made, and the location for the proposed antiseptic grooves determined. The Bierhoff-Freudenberg cystoscopic prostatic incisor (Figs. 38-39) combines the two instruments,

FIG. 38.—Bierhoff-Freudenberg's Cystoscopic Prostatic Incisor
Showing Cystoscope.

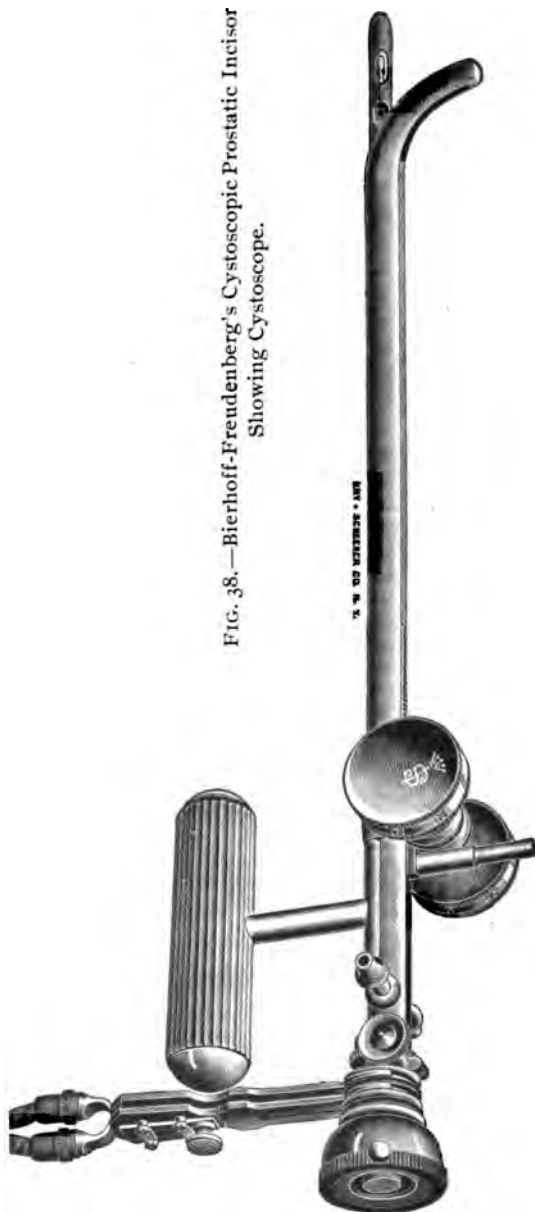


FIG. 39.—Bierhoff-Freudenberg's Cystoscopic Pro-latic Incisor
Showing Incisor.



obviating the necessity of the passage into the bladder **of more** than one surgical appliance. The vesical cavity **is emp-** tied by a soft rubber catheter and carefully douched **with a** warm saturated Boric acid solution until all foreign **matter is** removed. When cystitis is present the bladder **should be** finally washed with a solution of Nitrate of silver, 1-8000. If local anæsthesia is to be used (applicable only to the **strong** and robust), the catheter is withdrawn until its eye is **located** in the prostatic urethra, about one-half an inch from its **in-** ternal vesical opening. (This distance is previously **located** by a mark on the catheter which signifies the point at **which** the urine ceased to flow while withdrawing the catheter.) Two drachms of a 3 per cent. solution of Cocaine are **injected** into the deep urethra and the catheter removed.

Some prefer to induce anæsthesia of the parts by injecting into the empty rectum, forty minutes before the proposed operation, three ounces of Guyon's solution,

℞ Antipyrin.	grs. xxiv.
Tinct. Opii.	m. x.
Aqua	℥. iij.

and into the prostatic urethra just before the operation one ounce of a 1 per cent. solution of Cocaine. In the nervous and feeble better results follow if general anæsthesia by Nitrous oxide or Oxygen and Chloroform are employed. When the anæsthesia is complete, three to six ounces of a warm saturated aqueous solution of Boric acid are injected into the bladder, which distends its walls and prevents any parietal fold being caught by the incisor and accidentally perforated. Distension of the bladder by air has also been used. The Bottini instrument is introduced in the same manner as a urethral sound; when fully within the bladder it is turned so that the curved beak is directed towards the rectum, and brought forward so that it closely embraces the posterior median portion or bladder surface of the prostatic obstruction and the handle

is somewhat raised. The index finger of the right hand is then introduced into the rectum and the point of the instrument located. When the incisor is correctly placed, the finger is removed, the iced-water started through the cooling apparatus, the electric contact made and a current of fifty ampères is allowed to pass through the cautery blade for fifteen seconds, which will bring it to a cherry-red color. The blade is then brought slowly forward through the obstructing prostatic overgrowth by turning the archimedean screw to the right. This sears a groove but does not produce a thick eschar. On healing it leaves a V-shaped channel, broad at the surface and narrow at the bottom, which does not tend to close by adhesive inflammation or later contraction. The length of the posterior incision should vary with the character of the growth. When the hypertrophy is largely fibrinous the groove should be the estimated length of the prostatic urethra; when the muscular elements predominate, owing to the compressible nature of the tissue to be incised and to prevent opening of the membranous urethra, it should be two to three centimeters less. Fifty-five seconds should be allowed for each centimeter incised. If the incision is made too rapidly or the current has an ampèrage of less than fifty, hæmorrhage may follow. When the groove has been made the proper length the incisor is slowly resheathed in the female shaft by turning the archimedean screw to the left. When a posterior, anterior and one lateral incision are advisable the lateral incision should be two-thirds and the anterior one-third the length of the posterior incision; when two lateral and a posterior incisions are indicated the lateral should be one-half to two-thirds the length of the posterior according to the dimension of the growth. In the majority, after this operation, if the wall of the bladder has not lost its atonic qualities, subsequent catheterization is unnecessary, the urine being soon voided in a thick broad stream. It is, however, if the

detrusor muscle of the bladder has been greatly weakened, often required; reactive inflammation may produce frequent calls to micturate. Complete retention for a few days may necessitate continuous catheterization. Tenesmus and burning are frequent and often troublesome symptoms. Dribbling of urine sometimes happens for a few days or weeks after this operation, especially when the bladder wall is hypertrophied; the incontinence finally disappears unless the incision was too extensive and involved the membranous urethra. There is generally a flow of a few drops of blood with the removal of the incisor; the urine may even for a few days be slightly discolored. Between the fourteenth and twenty-first days as the eschar is thrown off, quite profuse bleeding may occur; usually it is unimportant. The early hæmorrhage is controlled by hot water irrigation. If not successful, a perineal or supra-pubic cystotomy may be necessary. Shreds of burned tissue are present in the urine for about three weeks after this operation; if large they may accumulate in the bladder and require removal by bladder douches. After the operation water should be ingested in large quantities; if the daily secretion of urine falls below fifty ounces, diuretics will be indicated, *i. e.*, Sodium chloride, ten grains in capsules every four hours, or Potassium acetate, twenty grains and Sweet spirits of nitre, one drachm, in four ounces of water every four hours until the kidneys commence to act properly. A temperature of 102° to 105° Fahr. on the night of the operation, is not infrequent; it may continue until after a movement of the bowels. Sometimes there is, until the eschar is entirely thrown off, a continuous temperature of 99° to 101° Fahr. Occasionally the first operation fails to relieve the obstruction and a second may be required. Complications and death may be due to the perforation of the superior wall of the bladder when intestinal adhesions are present, to extravasation of urine and perineal abscess from injury of the mem-

branous urethra or perforation of the posterior bladder wall when adhesions due to a peri-cystitis, proctitis or seminal vesiculitis exist, to toxæmia from opening a pus pocket in the diseased prostate, or abscess of the prostate, thrombosis of the lungs from blood clots, simple or suppurative epididymo-orchitis, urinary incontinence from excessive incision of the parts, etc.

Chetwood's Operation.—The best friends of the Bottini-Freudenberg galvano-cautery prostatotomy acknowledge that it has many disadvantages; *e. g.*, if the incision is carried too far, urinary infiltration results; if it is not sufficiently extensive, it is often necessary to repeat the operation. According to statistics, every fifth case has required a repetition of the operation. Convalescence is often painful, tedious and interrupted by complications, particularly urinary infiltration, necessitating perineal section, etc. To sum up, the one objection to the Bottini operation, when advisable, is that it makes an incision in the wall of an infected cavity without providing proper drainage. This was first noticed by Ashcraft, who advised in prostatic hypertrophy, where there was an associated cystitis, preceding the Bottini operation by a perineal section and to follow it for a few days by continuous vesical perineal drainage. The Chetwood operation has all the advantages of the Bottini-Freudenberg galvano-cautery operation and adds safety and precision. The patient, after proper surgical preparation, is placed in the lithotomy position and a perineal cystotomy is performed. The finger is then introduced into the bladder and this viscus and its urethral opening explored. The shape of the prostate is determined and an estimate made of the location and the depth of the grooves which it will be necessary to make through the obstructing mass, to lower the vesical dam and allow of proper bladder drainage. If these cautery canals are not sufficient, a prostatectomy can be performed through the same opening. In its cautery blade the

Chetwood incisor (Fig. 40) resembles the Bottini instrument. As it is introduced through the perineum after an external urethrotomy it is obviously about one-half the length of the Bottini incisor. The cautery knife is drawn out by the surgeon's direct pull on the male shaft, the length of the incision being regulated by a small stop pin in the female shaft. The electric current required and general directions for the prostatic incision do not differ from those described under the Bottini operation. In place of the water-cooling apparatus a stream of cold water is directed from the meatus through the urethra, making its exit through the perineal wound dur-

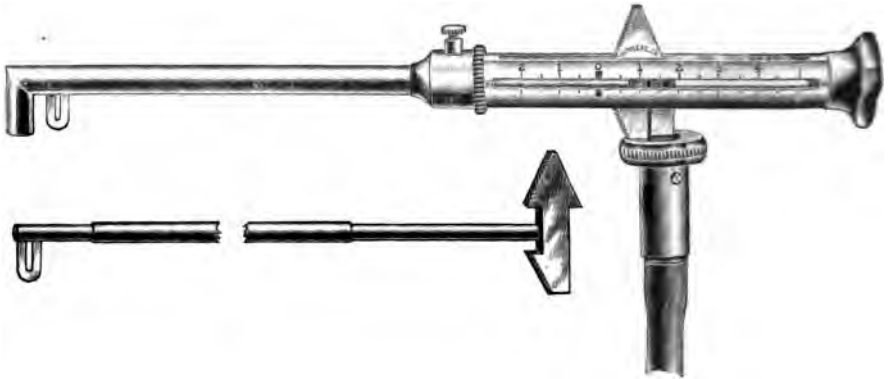


FIG. 40.—Chetwood's Galvano-Cautic Prostatic Incisor.

ing the operation. The instrument is fitted with three knives to suit the individual case. In the Chetwood operation (Fig. 41), after introducing the instrument and turning it to its proper place with the distal end embracing the prostatic obstruction, the index finger of the left hand is inserted into the rectum and by its tip, through the anterior rectal wall, the end of the instrument is maintained in position. After the incisions are made as outlined in the Bottini operation, the tip of the right index finger is introduced into the bladder and, if the obstruction has not been sufficiently removed, the opera-

tion is repeated, or, if necessary, a prostatectomy may be performed. A perineal drainage tube is inserted to give continuous urinary drainage, through it the bladder should be douched twice a day during the four or five days the perineal tube is allowed to remain. Catheterization after its removal may be necessary for a few days. The perineal wound usually closes by the end of the fourth week.

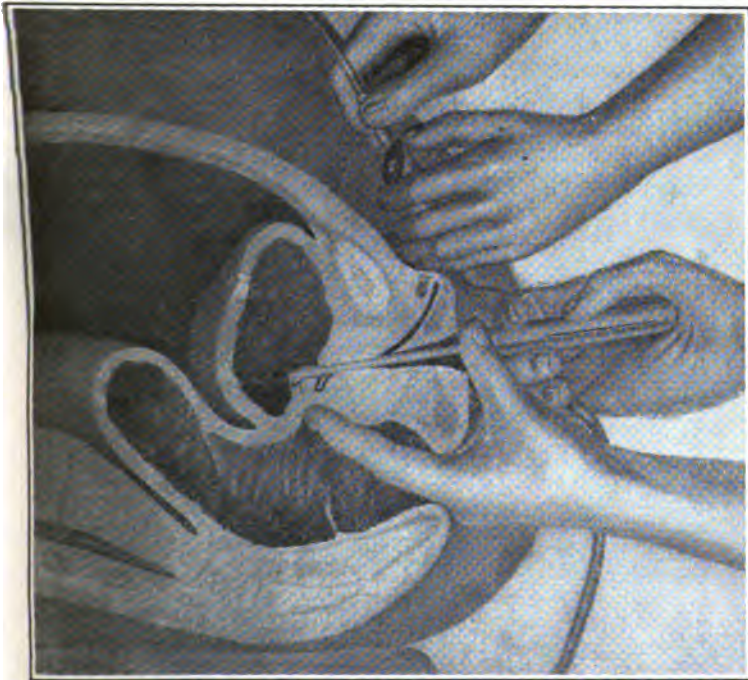


FIG. 41.—Chetwood's Galvano-Cautic Prostatectomy.

Prostatectomy may be performed in various ways, the principal methods being as follows: Supra-pubic prostatectomy without perineal drainage, McGill; with perineal drainage, Fuller; combined with perineal section and drainage, Belfast;

perineal prostatectomy by extensive anterior dissection, Zuck-erland, von Dittel ; combined with supra-pubic opening with-
out opening the bladder, Johnson ; posterior prostatectomy by
the sacral route, Rydygier ; perineal prostatectomy combined
with supra-pubic cystotomy, Alexander. The first three de-
pend practically upon the same principles, only Fuller's
is free from the serious objection that the cavity from which
the prostate has been removed is not properly drained.
Zuckerland's, Johnson's, von Dittel's and Rydygier's perineal
prostatectomies require extensive dissections, prolonged anæ-
sthesia and allow of no bladder drainage, hence they are ob-
jectionable, particularly in the old and enfeebled, or when
chronic cystitis exists. The operation of choice, therefore,
should be Fuller's or Alexander's, or some modification, as the
individual growth may necessitate. In the supra-pubic
method the patient is placed either upon the back or in the
Trendelenburg position, the bladder douched and finally dis-
tended with from eight to twelve ounces of a hot aqueous
solution of Boric acid, and a supra-pubic cystotomy performed
according to approved surgical methods. The forefinger of
the left hand is then introduced into the bladder and the inner
opening of the urethra located. A pair of scissors with long
handles and serrated edges are entered at the lower part of
the urethral opening and an incision made through the blad-
der wall backward for an inch or an inch and a half. Freyer
divides the mucous membrane covering the prostate with his
finger nail. The forefinger of the right hand is introduced
into the vesical opening, while continuous pressure is made
with the other hand against the perineum. Through the
opening over the prostate the tip of the right index finger is
inserted and by means of blunt dissection the lateral and
median lobes are usually easily shelled out. Sometimes,
however, forceps are required to complete the removal,
either *en masse* or in pieces. Pedunculated growths may

be caught with serrated forceps and twisted off. The cavity formed by the removal of the prostate is finally opened by a perineal section and a 35 F. perineal drainage tube inserted so that it projects into the cavity of the bladder, together with two bent supra-pubic drainage tubes, through the supra-pubic opening, which should be employed for the first few days. The tissues forming the space of Retzius should be walled off by a continuous catgut suture connecting the bladder wall with the muscular parietes of the abdomen. Troublesome bleeding, which is often present, is usually controlled by through and through irrigation with a hot normal salt solution which should be continued for about two minutes. The supra-pubic opening should be closed with silk-worm gut, one strand located to pass through the abdominal and bladder walls on either side of the wound at the upper part of the vesical opening, a similar one being located at the lower angle of the vesical incision. When tied they keep the bladder wall well against the abdominal wall and prevent motion of the parts and urinary extravasation. A third similar suture, centrally located, is introduced to be tied and completely close the wound, when the supra-pubic drainage tubes are removed. The sutures should not be removed until the patient has been around the room for some days, as they prevent opening of the newly united tissues when strain is placed upon them. The wound around the perineal drainage tube should at first, to prevent hæmorrhage, be carefully packed with Iodoform gauze. This tube can usually be removed in about ten days.

Perineal Prostatectomy.—When the prostatic overgrowth is confined largely to the lateral lobes of the organ (Fig. 42), and is composed mostly of the glandular and muscular elements, a perineal prostatectomy may be expected to give the most satisfactory results. The patient is placed in the exaggerated lithotomy position.

A variety of perineal incisions have been advocated. Dittel

advises a semi-lunar, pre-anal incision, the highest point of the curve corresponding to the lower third of the bulbous portion of the urethra. Generally an opening of sufficient size



FIG. 42.—Marked Enlargement of both Lateral Lobes and Globular Intra-Vesical Tumor of the Posterior Commissure. Removal of Tumor and both Lobes Required. Best Accomplished through Perineal and possibly Supra-pubic Combined Routes. Bottini Operation Inappropriate and Inadequate. (Bransford-Lewis.)

can be made by a vertical incision carried through the raphé of the perineum. Sinn increases the area of the operative space by extending the incision downward on either side of

the rectum in the form of an inverted Y. By blunt dissection the bulbo-cavernosus muscle is easily reached and its tendinous junction revealed and divided with the external sphincter ani muscle. Then the membranous urethra distended by a proper urethral staff is readily exposed. By working backward on either side of the membranous urethra the lateral lobes of the prostate are disclosed. The membranous urethra is then incised on the staff and a Young's metallic retractor (Fig. 43) introduced and opened (Fig. 44). This permits any amount of traction upon the organ as well as locating the walls of the urethra. It also, by compression, acts as a hæmostat. A straight longitudinal incision is made through the capsule of the right prostate about one-half inch from and parallel to the urethra. Young recommends that this incision be made slightly convergent toward the upper end to prevent any possible injury to the ejaculatory duct. Many open the capsule of the prostate by a transverse incision beneath the prostatic urethra. The incision through the capsule should be about one centimeter deep. After the capsule is opened the glandular tissue should be separated from the capsule with the index finger, the enucleation being made first over the upper part of the organ. If the lower part is first separated, much difficulty may be encountered in finally enucleating the upper segment of the organ. As a rule, the larger the gland the more easily it is enucleated. Often the entire prostate can be removed *en masse*. Occasionally retractors and forceps will be necessary to remove it in pieces of various sizes. In extracting the enucleated lobe it should be drawn slightly upward, a downward direction often tears the rectal tissues. On approaching the prostatic urethra the prostatic tissue immediately adjacent to this canal should be left intact. It is called the preservation of the ejaculatory ridge. The index finger of the left hand may largely serve the purpose of a Young's retractor. After enucleation of both lateral lobes each pros-



FIG. 43.—Young's Prostatic Retractor Closed.



FIG. 44.—Young's Prostatic Retractor Opened.

tatic cavity is packed sufficiently with strips of aseptic gauze to control the hæmorrhage, and the operation is completed as advised in external urethrotomy. The tampons and drains, unless contra-indicated by aseptic conditions, are removed on the fourth or fifth day. After the removal of the drainage tube a full-sized urethral sound is passed once a week for two months. Packard describes his operation as follows: The patient is placed in the lithotomy position, with the knees



FIG. 45.—Inverted Y Perineal Incision. (Packard.)

drawn well up toward the thorax and the feet lifted high above the plane of the pelvis. His combined searcher and staff is introduced into the urethra. The perineal incision is carried along the raphé from the scrotum to the sphincter ani, then continued backward on each side of the anus (Fig. 45) until the whole forms an inverted Y. He dissects carefully

through the perineal tissues, until the resistance of the **staff** can be felt in the membranous portion of the urethra, **retracting** the parts widely (Fig. 46) to either side as rapidly as **they** are divided, and ligating all bleeding vessels as fast as **exposed**. Throughout this part of the operation caution against **wound-**ing the rectum should be observed. The membranous **portion** of the urethra is opened along the groove of the staff for a **dis-**



**Fig. 46.—Deep Structure of the Perineum Widely Retracted
Exposing the Membranous Urethra which has been
Incised just Anterior to the Prostate Gland.
(Packard.)**

tance of about two centimeters. The staff is slightly withdrawn and the beak of the irrigator (Fig. 47) is thrust into the incision in the urethra, and through the sphincter into the bladder, the vesical cavity is then thoroughly irrigated with sterile water and, if sepsis is present, with a 1-500 Formalin solution.

The irrigator being withdrawn the index finger of the left hand of the surgeon is passed through the dilated sphincter and the existence of a projecting or pendulous middle lobe, encroaching upon the lumen of the outlet, determined. If found, a prostatome is carefully passed along the finger as a guide and the projecting lobe cut off cleanly at its base. The staff is now passed into the bladder and turned so



Fig. 47.—Bladder Irrigation. (Packard.)

that the curve rests against the left lobe of the prostate. The staff being used as a lever—working the arch of the pubis as a fulcrum—the base of the bladder is fixed and the prostate pushed downward (Fig. 48) into the perineum. With toothed forceps and scalpel the posterior angle of the urethral wound is traced backward until the capsule of the prostate gland is opened, care being given not to wound the sphincter. The

outer edge of the exposed capsule is grasped with **the forceps**, and, using a blunt dissector and tip of the index **finger**, the capsule is dissected away from the gland in all **directions** as far as possible, without using violence. The left lobe of the partly enucleated prostate is grasped with the **forceps**

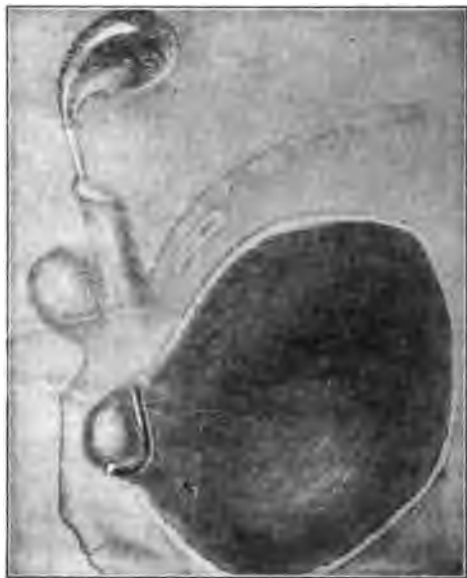


Fig. 48.—Base of Bladder and Prostate Gland Depressed and Steadied by the Packard Staff Introduced through the Urethra. (Packard.)

(Fig. 49), the staff partly withdrawn, and the forefinger of the left hand passed through the sphincter into the bladder to act as a guide to the prostatome and the pedicle of the left lobe and the lobe excised close to the bladder wall. The right lobe is excised in the same way, excepting that the index finger of the right hand is inserted within the sphincter and the prostatome operated with the left hand. A perineal drainage tube is passed into the bladder, and through it the

bladder is given a final irrigation to wash out any accumulated blood clots, etc. Long strips of borated gauze are packed into the cavities from which the prostatic lobes have been removed. The posterior limbs of the inverted Y incision are closed with silk-worm gut sutures and the drainage tube fastened in place with the same material.



Fig. 49.—The Operator's Finger within the Sphincter; Lateral Volsellum Forceps Grasp the Partly Enucleated Left Lobe of the Prostate Gland; the Curved Prostatome Severs the Remaining Attachment. (Packard.)

Nichol modified the scope of perineal prostatectomy by making a preliminary supra-pubic cystotomy for the purpose of pressing the prostate well down into the perineal opening, through which he shelled the gland from its capsule by means of the finger or curette.

Alexander, following the Nichol method, opens the membranous urethra on a staff by the ordinary median perineal incision. After the staff is removed he passes two fingers into the bladder from above, pressing down the prostate, and with the forefinger of the right hand tears the capsule of the prostate through at its apex close to the prostatic urethra and enucleates the gland through the perineum by blunt dissection. The lateral lobes are first removed, and finally the so-called third lobe, if hypertrophied. Hæmorrhage is not

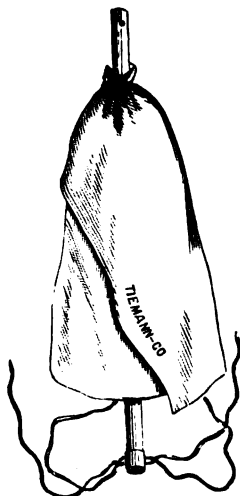


FIG. 50.—Canular a' Chemise.

severe. The wound is dressed and supra-pubic and perineal drainage established.

Dr. Parker-Syms does away with the supra-pubic opening. He drags the prostate well down into the perineal wound by tension on a band connected with a rubber bag previously passed into the bladder and inflated.

Dr. George F. Shears, of Chicago, has discarded the col-pourteur of Syms and finds that the volsella is all sufficient.

Hæmorrhage following enucleation of the prostate is sometimes free and often alarming. It may be controlled by very hot water irrigations or packing the cavity with sterile gauze or the Keyes' tampon (Fig. 50), made of Bichloride of mercury gauze, may be utilized. If employed, it should always be removed in twenty-four hours.

The removal of the prostate should be followed by a thorough flushing of the wound with a hot aqueous solution of Bichloride of mercury, 1-5000, supra-pubic or perineal drainage tubes inserted and the wound closed according to general surgical methods. After this operation, large quantities of water should be ingested and a liberal diet advised. Frequent turning from side to side or to a semi-erect position in bed must be commenced early, and by the tenth day the patient should be assisted to a lounge there to remain for half an hour or more daily.

The carefully selected remedy often gives much relief and postpones, if it does not always obviate, the necessity of surgical attention.

Arnica is indicated for the irritation and crawling sensation in the deep urethra, producing a desire to scratch the perineum, though usually without relief, also for the irritable and overworked bladder. Perhaps its great usefulness in the various prostatic conditions is indicated by the bruising to which the enlarged organ is so constantly subjected. The relief of the various symptoms as well as the reduction in the size of the organ which has followed its continued use has often been to the author a surprise.

Buchu has frequently relieved the frequent desire to evacuate the bladder with burning at the neck when urinating.

Chimaphilla umbellata is indicated by the large amount of muco-purulent material or blood in the urine, dragging pains in the prostate and loins, etc.

Conium.—The intermittent flow of urine is very character-

istic and this drug is often extremely beneficial in hypertrophy of the prostate especially when accompanied with perspiration during sleep.

Ferrum picrate.—The distressing desire to frequently urinate during the night as well as the burning sensation at the neck of the bladder are relieved by this remedy. It has many symptoms in common with Picric acid. Often it has held the prostatic overgrowth in check and even cured.

Mercurius corrosivus when the vesical tenesmus is accompanied by pronounced rectal straining, irritation of the rectum, venous congestion and extravasation in some portion of the rectal mucous membrane.

Picric acid is very often indicated for the frequent calls to evacuate the bladder at night, with residual urine, extreme weakness, sensation of pins and needles in the limbs, troublesome erections at night occurring in those of a sallow complexion with dark hair.

Sabal serrulata must be given in twenty to sixty drop doses in order to be effective. It is suitable for elderly men with pain in the prostate (congestive); dull, throbbing pain in the neck of the bladder extending into the spermatic cord; mental and sexual vigor on the decline; starting in the first sleep as from fright. It seems to increase the muscular power of the prostate and vesical cavity and relieve the congestion.

Sarsaparilla.—Prostatic hypertrophy accompanied with pain and tenesmus at the end of micturition. It is sometimes almost unbearable, often accompanied with tenesmus of the bladder.

Saururus cornuus.—Has been beneficial in prostatic hypertrophy with painful and difficult micturition.

Staphisagria.—Particularly useful in the backache accompanying prostatic hypertrophy, which is worse at night in bed and in the morning when arising. It has one symptom

which is particularly characteristic—the burning in the urethra is relieved while voiding the urine.

Trillium repens in the infusion relieves the vesical stranguery.

The atonic non-infected bladder often calls for Sulphur, Causticum or Nux vomica. For other remedies and their indications consult those given under chronic cystitis and urethral prostatitis, and Carleton and Coles' *Symptomatic Index*.

Contraction of the Vesical Neck of the bladder.—Hypertrophy of the posterior band of prostatic muscular fibres, mucous membrane, etc., encircling the neck of the bladder. This condition has been described by Sockell as "*la contraction douloureuse du col de la vessie*." Civiale considered it to be a simple fold or barrier of mucous membrane containing fibrous or muscular tissue; Mercier, as a urethro-vesical barrier produced by muscular spasm. Fuller presented the first complete theory on the subject under the title of "Chronic Contraction of the Prostatic Fibres Encircling the Vesical Neck."

Etiology. It may be caused by any chronic inflammation, gonorrhoea, or otherwise, of the prostatic urethra or the trigone of the bladder. It may be due to a traumatism of the urethral orifice of the bladder. It may be associated with a prostatic calculus or tuberculous prostatitis. It may be associated with vesical hypertrophy or be induced by the irritation of a vesical abscess or calculus, tuberculosis of the prostate, a prostatic abscess or any suppurative condition involving the region. It may follow a long-continued functional contraction due to some sexual derangement, a lesion of the kidney, rectum, seminal vesicles, or a prostatic calculus, continued forced retention of urine, etc.

Pathological Anatomy.—The lesion consists in an overgrowth of the muscular fibres of the prostate surrounding the neck of the bladder, with some elevation of the mucous and sub-mucous tissues forming the vesical neck. In other words,

it is a **fibrinous** stenosis or obstruction at the neck of the bladder which interferes with the normal expulsion of the urine and with the elasticity of the sphincter, preventing its normal contraction and dilatation, and the complete closure of the bladder exit. The bladder complications and urinary symptoms are similar to those present in prostatic hypertrophy. which only the **need** stenosis may occur, a small opening, through the tip of the finger can be made to enter the bladder occupying the place of the normal roomy outlet, which should be located with **difficulty**. The urethra anterior to the strictured band remains of **normal** calibre. There is no co-existing enlargement of the prostate or increase in length of the urethral canal.

Clinical History.—This disease in many respects closely resembles in its subjective manifestations prostatic hypertrophy and vesical calculus. It may exist in a moderate degree without producing symptoms. It occurs most frequently as a distinctive malady between the ages of twenty-five and fifty, though it may develop at any age. After the fiftieth year it may appear as a separate condition or as a complication of a prostatic hypertrophy. Generally it is preceded by some sexual disorder, or some disease of the kidney, rectum, etc. The prominent symptoms are produced by the interference with the natural expulsion of the urine which may amount to complete retention, and if not relieved by surgical methods may require the constant use of the catheter. Hesitancy in the commencement of the act of micturition is generally the first manifestation. This is followed by a slight dribbling of urine and a sensation of incomplete evacuation of the bladder. The calls to urinate increase in frequency and may occur as often as every half hour. The desire may become imperative, and if the call is neglected it may produce considerable pain. In the early period of the disease the symptoms are due to obstruction to the normal exit of the urine; later they be-

come associated with those due to cystitis. Urinary retention is always present to a certain extent. Contraction of the neck of the bladder often occurs as a sequel of a chronic posterior urethritis, which seems to resist all forms of local treatment. These imperative calls to micturate, if neglected, often result in a slight incontinence of urine and some pain during and after urination. It is a common accompaniment of vesical calculus.

Diagnosis.—Contraction of the neck of the bladder may always be suspected when during the course of a chronic gonorrhœa there is imperative urination, or when a man under forty-five has the symptoms of prostatic hypertrophy, yet on introducing a catheter eight and one-half inches into his urethra urine flows from its distal end, demonstrating that there is no special elongation of the urethra canal.

Prognosis.—Operative measures are often necessary; the mortality is low. Sometimes when the disease is due to a chronic posterior gonorrhœal urethritis the disorder will do well under protracted local treatment.

Treatment.—The Chetwood galvano-cautery prostatotomy gives excellent results; the barrier at the neck of the bladder may be torn through with the finger or cut somewhat obliquely posteriorly downward and outward after a previous external urethrotomy.

Malignant Growths of the Prostate.—These tumefactions may be primary or secondary. When due to invasion from other organs the condition is so critical that nothing but palliation is advisable. Primary cancer of the prostate is comparatively rare. Out of 1,904 cases of cancer of the prostate reported by Tauchon only five originated in the prostate. When occurring as primary lesions they usually appear before the tenth year or after the fiftieth year. Sarcoma may occur at any period of life, but more than 50 per cent. develop between the first and the eighth year. Carcinoma is the

usual form in the later periods of life. In middle *life the* ratio is about even.

Pathological Anatomy.—Fenwick classifies malignant *prostatic* growths as hard or soft. The hard variety has *three* stages: (1) The growth feeling like a buried stone in the *diseased* lobe, does not project, and at first the opposite *side of* the prostate seems normal; as the disease progresses it *becomes* involved, though the interlobular sulcus remains, *the* fibrinous covering becoming tense; (2) the latent stage *in* which the symptomatic manifestations of the disease to a *large* degree suddenly disappear, due to rupture of the tense *prostatic* capsule, which occurs at the posterior and upper aspect where it joins the seminal vesicles, and by rectal touch the prostate feels flattened, elongated and apparently fused with the seminal vesicles; (3) rapid involvement of the pelvic and abdominal lymphatics, causing pressure upon the veins and other vessels. The growth in the prostate extends rapidly and involves the bladder, seminal vesicles, urethra, etc., destroying by necrobiosis the diseased tissues and opening the neighboring cavities. If the bladder wall is involved the exposed neoplasm may become coated with phosphatic deposits. In the soft variety, the growth progresses very rapidly, causing urinary retention and breaking down into a circumscribed, soft, semi-fluctuating mass of tissue, blood, etc.

Clinical History.—The symptomatic manifestations of the various forms of malignant invasions of the prostate are similar; they cannot be differentiated by their clinical history. In the early period the symptoms may be only those of slight urinary retention due to a local obstruction situated in the prostatic urethra, painful and difficult micturition being present in 80 per cent., retention in 16 per cent., and incontinence in 4 per cent. Hæmaturia is often present; it may be profuse, scanty, intermittent, or terminal. Complete retention of the urine may develop rapidly, with rectal tenes-

mus, pain in the scrotum or along the inner side of the thighs and in the hypogastric region.

Diagnosis.—An early recognition of this disease is uncommon. It may be suspected in the young and middle-aged, in whom, without previous urinary disorder or evidence of renal or vesical calculus or disease in the seminal vesicles, there develops slight hæmaturia with increased frequency in the calls to micturate, though the condition may also be due to a benign neoplasm. Rectal examination may reveal no enlargement of the prostate; particularly is this true when the lesion is situated near the urethral portion. At a later period, the gland will have a decidedly nodular feel, and, as the disease extends, it will become firmly attached by adhesive inflammation to the surrounding tissues, which, with the pelvic floor, will seem immovable; the lymphatic vessels in the retro-vesical space giving by rectal touch the impression of hard cords or canals. In the aged, an early diagnosis is very difficult, as a prostatic hypertrophy may produce all the first symptoms even to the hæmaturia. As the disease advances, even if engrafted upon a prostatic hypertrophy, the characteristic nodular feel and adhesion to the neighboring tissues will facilitate the diagnosis. Unless the patient is prepared for operation, if found necessary, urethral instrumentation should be avoided, as it will surely aggravate the condition, produce hæmaturia, etc.

Prognosis.—In children the disease is invariably fatal, death occurring in two or three months; in middle life, the duration is about a year, and in those past fifty-five, from two to five years.

Treatment.—Owing to the rapid advance of the disease in children, and even in those of middle life, little can be done except to relieve the symptoms by Arsenicum, Condurango, Conium, Cantharides, Turpentine, etc., and anodynes when required. The X-ray is often beneficial if not curative.

Catheterization should be postponed as long as possible, though when it becomes necessary it should be followed, each time by a bladder douche of a saturated aqueous solution of Boric acid. If catheterization becomes very painful, causes hæmorrhage, or it is impossible, supra-pubic cystotomy for drainage will be required, employing a Senn or ordinary vesical drainage tube to keep the wound open. When these methods of relief are instituted the bladder should be irrigated daily with a hot aqueous solution of Boric acid. In the aged, if the growth is diagnosed while the disease is confined to the prostate, that is, before the rectum, the post-prostatic lymphatics, the seminal vesicles or the bladder wall beyond the trigone are involved, removal of the diseased area is indicated, preferably by the supra-pubic route. After proper preparation the usual incision for a supra-pubic cystotomy is made, the recti muscles sufficiently divided, and the vesical space exposed. An incision is made encircling the bladder wall over the apparent seat of the growth or that part which seems diseased. The edges of the vesical wall are picked up, and, with the vesical serrated scissors, the diseased tissues of the prostate cut out, except posteriorly near the rectum, where blunt dissection with the fingers is substituted to avoid laceration of the rectal tissues. Bleeding can generally be controlled by hot water irrigation. The space formed by the removal of the growth is opened through the perineum and a drainage tube inserted. The bladder wall should be partly closed and two Guyon's bent vesical drainage tubes properly located and fixed. Gauze packing may be required. The perineal drainage tube should be removed about the seventh day and the supra-pubic about the end of the third week. The usual toilet of the bladder, etc., customary to similar bladder operations should be observed.

Tubercular Prostatitis.—Etiology.—This disease may be primary, though it is usually secondary to the involvement

of adjacent or remote organs, the bacilli being carried to the prostate by the blood current or lodged in the prostatic tissues from the urine. It is always dependent upon the presence of the tubercle bacilli and their ptomaines in the prostatic tissues. The primary variety is essentially a disease of young men. Generally it is preceded by a gonorrhœa of the prostatic urethra, or hyperæmia of the organ due to sexual excess or excessive desire without gratification, alcoholism, etc. Anything which causes prostatic congestion may be considered a predisposing cause in susceptible subjects.

Pathological Anatomy.—The pathological changes differ little from those of tuberculosis involving any other organ of the body. The prostate is usually considerably enlarged by inflammatory congestion. The primary nodules are located in the vicinity of the tubules; by amalgamating they form large caseous masses in either the lateral or middle lobe, or both, in which abscesses slowly develop; gradually burrowing, they may open into the urethra, rectum, perineum or hypogastrium, and numerous fistulous tracts result. Occasionally the tubercular mass becomes calcified and the disease becomes stationary.

Clinical History.—This disease has been little studied or understood. Thompson says there is no characteristic clinical history. It is a fact that many suffering from tubercular prostatitis when the primary deposit is at the periphery of the organ or in the peri-prostatic tissues have no symptoms, or so few as not to attract attention, pain, weight and tenderness in the perineum, together with rectal tenesmus, not being noticeable until considerable tubercular material, sufficient to cause some mechanical disturbance, has been deposited. When the tubercular mass is situated near the prostatic urethra the manifestations are practically those of a chronic catarrhal prostatitis. Generally there is a recurrent or continuous muco-purulent discharge from the urethra, which

contains tubercular bacilli. Hæmaturia is of common occurrence. The fusiform clots characteristic of prostatic hæmorrhage are often present. The urine generally contains mucus, epithelium, thready filaments, and sometimes, when ulceration is present, masses of tubercular tissue. During the early period of the disease, there may be an associated tubercular epididymitis.

Diagnosis.—Tubercular nodules in the prostate as distinguished by rectal examination, are usually more circumscribed than an overgrowth due to hypertrophy; as the disease progresses the nodulations soften and fluctuation may be discovered. Finally there may be infiltration of the peri-prostatic tissues, which sometimes becomes so extensive and diffuse that it obscures almost or entirely the outlines of the prostate and surrounding parts.

Prognosis.—Recovery may occur, but it is unusual.

Treatment.—The general health must receive careful attention, hygienic, climatic and medicinal, such as would be indicated for tuberculosis in other parts of the body. When primary tubercular prostatitis is diagnosed, parenchymatous injections of ten to fifteen drops of a 10 per cent. Iodoform-Glycerine emulsion, introduced by a long needle through the perineum every third to fifth day, has sometimes been apparently of great benefit. When the disease is located upon or near the prostatic urethra, urethral instillations of Bichloride of mercury, 1-6000, have been serviceable. Thalline sulphate, 1-7, sometimes acts kindly. Urethral instillations of the silver solutions should never be employed in this variety of prostatic disease, as they cause exacerbations of the local lesions and increased suffering. Hot rectal douches of Chamomile tea are very agreeable and often give much relief to the pain. Local instrumentation, as a rule, is harmful. The X-ray has been beneficial. When abscesses develop they must be incised through the perineum, curetted, and the cavities

packed with Iodoform gauze. The wound rarely heals; a fistula usually results. Prostatectomy is contra-indicated.

Cysts of the Prostate.—These circumscribed fluid accumulations may be caused by obstruction of a prostatic tubule or be of hydatid origin, the symptoms depending upon the size of the cyst and its interference with micturition and defecation.

Prostatic Calculi.—These concretions may be single or multiple, the latter being the most common. One hundred or more calculi varying from a microscopic point to an inch in diameter, dark in color, hard and composed largely of phosphate of lime, may be scattered through the organ. The calculi have granular nuclei, and are made up of broken-down cells and inspissated mucus, evolved in concentric layers; they are known as the corpora amylacea. When situated deep in the organ they may occasion no symptoms, but when near the urethra, especially in the region of the veru montanum, they may, by ulceration, open into it; the salts of the urine then assist in their rapid growth and in producing more extensive ulceration. Finally they produce a sense of uneasiness and pain in the deep urethra, with increased frequency in the calls to micturate, which will continue until they are dislodged. They can often be demonstrated by examination of the prostate by rectal touch. They must be differentiated from a small vesical calculus which has escaped into the prostatic urethra; this produces intense vesical tenesmus, frequent micturition, hæmaturia and possibly urinary retention from obstruction. The introduction of a sound may force the escaped vesical calculus back into the bladder and give immediate relief; the imbedded prostatic calculus may be located by the grating noise caused as the sound passes over it, but the symptoms will remain unchanged. The true prostatic calculus may, however, finally be dislodged and be voided per urethra or fall back into the bladder and act as a nucleus for a vesical calcu-

lus; deep-seated prostatic calculi have been known to work outward into the peri-prostatic tissues necessitating their surgical removal. When they project into the urethra it is sometimes possible to locate them through the urethroscope and remove them with the urethral forceps, though as a rule, when they cause unpleasant symptoms, perineal section and extraction is called for.

Thrombosis of the Prostatic Plexus and Phleboliths.—In severe inflammation of the prostate, particularly when it is infectious in nature or after a surgical procedure, the loose tissue surrounding the prostate may become involved and cause a thrombosis in one of the associated veins, the walls of which are involved to a varying degree. The condition is generally overlooked except when the septic invasion extends and involves the iliac and femoral veins and produces a true phlegmasia alba dolens. Sometimes small concretions form in the veins of the prostatic plexus. They are called phleboliths and have no known symptomatic history.

Treatment.—Hamamelis, Apis mellifica, Arnica, Echinacea, etc., have acted well in conjunction with hot rectal irrigations containing extract of Hamamelis, Chamomile tea, Salt, etc., with rest and other methods indicated.

SECTION IX.

ANATOMY, ANOMALIES, INJURIES AND DISEASES OF THE URETHRA.

Anatomy of the Urethra.—The male urethra, when the penis is in a state of repose, averages eight to nine inches in length. Commencing at the glans penis in what is known as the meatus urinarius it extends backward to the bladder, terminating in the sphincter vesicæ. It perforates the triangular ligament which divides it into an anterior and a posterior portion. The anterior portion is surrounded by the corpus spongiosum ; the posterior by the compressor urethræ muscle and the prostate. The anterior urethra varies from six to seven inches in length, depending upon the degree of development of the individual penis. It is composed of four portions—the navicular, which is boat-shaped from coarctation of the meatus in front and the narrowing of the canal posteriorly, and is from three-eighths to one inch in length ; the penile portion is about two and one-half inches long, and extends from the navicular portion to the junction of the penis and the scrotum ; the scrotal corresponds to that part of the canal which is situated above the scrotum, the bulbo-perineal, about an inch and a quarter in length, extending from the scrotal portion to the point where the urethra pierces the triangular ligament, this portion of the canal being very distensible is, in elderly people, often much dilated, though usually it is closed by the natural contraction of the accelerator urinæ muscle. The posterior urethra is about two inches in length and differs from the anterior portion in

not being surrounded by erectile tissue. It extends from **the** triangular ligament to the bladder, and, from the structure through which it passes, is classified as the membranous **and** prostatic portions, the former being a little less than an **inch** in length and surrounded by the compressor urethræ muscle ; the latter is about one inch long and tunnels the prostate.

The urethra has four points of natural physiological narrowing, *i. e.*, the first, is located at the meatus, the second at the peno-navicular junction, the third, the most contracted part of the urethra, about three and one-half inches from the meatus, and, a fourth, in the posterior urethra which is due to the voluntary constriction of the compressor urethræ. These constrictions produce a tube of uneven calibre with three dilations, *i. e.*, the first, the fossa navicularis, so-called from its boat-shaped form ; second, the bulbous, situated immediately in front of the triangular ligament, and third, the prostatic sinus, situated within the prostate.

The urethral canal is always collapsed except during micturition, when the seminal fluid is being discharged or it is distended by some foreign body. On cross section through the glans penis the canal appears as a vertical slit, at the base of the glans penis as a broad inverted T, in the penile, scrotal and perino-bulbous portions as a transverse slit, in the membranous region it is star-shaped and in the prostatic urethra it is like an inverted Y. The walls of the urethra are made up from within outward of an epithelial, connective tissue, muscular and erectile tissue layer. The mucous membrane presents longitudinal and transverse folds, permitting great extension when the penis becomes erected, and expansion during the act of micturition, instrumentation, etc.

Stratified pavement epithelium lines the fossa navicularis. From within outward it consists of a superficial layer of cylindrical cells, a transitional layer and one of cuboidal cells. The epithelium of the penile portion of the urethra is of the

glandular type; at the prostatic portion of the canal it becomes stratified and continues so to the bladder, blending with the vesical stratified epithelium. Beneath the epithelial layer is situated the connective tissue, which is composed largely of elastic fibres, permitting great distensibility. The muscular coat comes next and consists of an inner or longitudinal layer in direct continuity with the inner fibres of the prostate, which is surrounded by an external circular coat, so arranged as to give the appearance of broad bands. At the junction of the urethra and bladder they are especially well developed and constitute the vesical sphincter. These two layers are reinforced in the prostatic and membranous regions by an extensive third layer of striated muscle fibres, which, at the point where the urethra emerges from the prostate, forms a sphincter-like band known as the external sphincter or cut-off muscle. The erectile layer has already been described under the anatomy of the penis.

The mucous membrane of the urethra presents upon its surface numerous small papillæ, which are especially abundant in the fossa navicularis. It is also studded with the minute orifices of the ducts of the glands of Littre, which are located in the mucous and sub-mucous tissues. These glands are of the conglomerate variety; they are undeveloped in the prostatic and membranous portions, but are especially prominent in the roof of the anterior portion of the canal, some being as large as pin heads. Their canals of exit are directed obliquely forward toward the meatus, terminating in the urethra, one in the roof of the fossa navicularis being quite large is designated as the lacunæ magna; occasionally it extends as far back as the triangular ligament and has been mistaken for a second urethra. Some of the crypts in the floor of the same region are also well developed. Cowper's glands, two in number, about the size of small beans, are situated below the membranous urethra, each gland having a duct about an inch

in length, which is directed forward and upward, **passing** through the triangular ligament and opening upon the **floor of** the bulbous urethra. These glands secrete a viscid **fluid**, which assists in lubricating the urethral canal.

On the floor of the prostatic urethra the mucous membrane presents a crest-like form known as the veru montanum. **At** its anterior termination is a little depression called the **sinus** pocularis, into which open the ejaculatory ducts. **On either** side of the veru montanum are the prostatic sinuses, **into** which open the mouths of the prostatic ducts, some twelve to twenty in number.

The membranous portion is the most fixed part of the urethra. The anterior urethra is freely movable and can be made to assume practically any curve. The roof of the posterior urethra has a fixed curve. Guyon has made the following observations relative to the floor and roof of the urethra: First, the roof of the urethra when the penis is erect forms an uninterrupted curve from the fossa navicularis to the bladder. Second, any variations of calibre, except in the fossa navicularis, are produced at the expense of the floor, which, in consequence, is very irregular. Third, the mucous membrane of the roof is more closely adherent to the subjacent structure than that of the floor. Fourth, the mucous membrane of the floor of the urethra is much more elastic than that of the roof. These points should never be forgotten when introducing a urethral instrument, which, if its tip is carried along the roof of the canal, may be easily introduced, whereas, if the tip presses upon the floor of the canal, it may become pocketed in the loose membrane, and then, if force is used, the urethral membrane may be perforated. The membranous urethra is fixed at its extremities by the two layers of the triangular ligament, and is located from two-fifths to four-fifths of an inch below the symphysis pubis. The fore part of the membranous urethra, because of the tension of the suspensory liga-

ment and fascia surrounding it, is directed slightly upward. A similar curve upward is given posteriorly to the prostatic urethra by the pubo-prostatic ligaments and the anterior fibres of the levator ani muscles. This produces the fixed curve of the urethra, though it can be overcome by the introduction of a straight steel urethral instrument. This flexure varies at different periods of life, being shortest in childhood and increasing in length with old age, being particularly enlarged when prostatic hypertrophy occurs. This curve, which was first recognized by Sir Chas. Bell and upon which Sir Henry Thompson constructed his urethral instruments, corresponds to that portion of a circle 8.125 cm. in diameter, which is subtended by a chord 6.875 cm. long. Urethral instruments made with this curve should, when properly directed, find their way into the bladder.

The internal or urethro-vesical opening of the male urethra is, when the man is standing erect, situated at the lowest point of the bladder. From this point the direction of the urethra is somewhat downward to the junction of the posterior and anterior urethra which is the lowest point in the whole canal. When the penis is in a state of erection, the anterior urethra becomes straightened and has an upward slant; when in a state of repose the part anterior to the bulbous portion takes a downward curve.

The average urethra admits of the introduction of a 27 or 28 F. Thompson conical steel sound without pain or over-distension, and a 30 F. can be introduced, though it will usually cause some distress. A straight sound can also be passed. The anterior urethra in health is but slightly sensitive while the posterior is practically insensible. The urethra has, from the muscular conformation of its walls, numerous irregularities, easily demonstrated with a full-sized olive-pointed bulbous bougie or the Otis urethrometer they must never be mistaken for urethral stricture. The normal urethra in

different individuals, varies considerably in color depending upon the state of the general constitution, condition of the penis and the vascularity of the parts. Generally, on endoscopic examination, it presents a rosy, reddish or bright red color. Under the influence of Cocaine it becomes slightly paler. In the region of the glans the membrane is smooth in appearance and poorly supplied with blood, therefore it is pale compared with the rest of the canal. From the coronary sulcus to the cul-de-sac of the bulb, longitudinal folds appear. The canal also presents some transverse folds. At the distal end of the endoscope the exposed mucous surface presents a central figure which changes in aspect in different regions of the urethra. In the glans it resembles a small vertical slit, in the penile it is punctiform, it becomes transverse in the region of the bulb, and in the posterior urethra the inferior wall is distinctly prominent. In the penile region the exposed mucous membrane is traversed by radiated longitudinal striations, extending outward from its central figure, these striations always being present in the normal membrane. The surface is smooth and shiny and the orifices of the lacunæ Morgagni are visible in the entire canal; in the bulbous region they appear as small slightly excavated points of the same color as the surrounding surface, or have a faint reddish appearance; they may be seen as small openings resembling the pricks made by a pin; their borders can scarcely be said to be raised above the contiguous surface, although when pathologically involved, they really become prominent. Littre's glands are absolutely obscured upon the healthy urethral mucous membrane, but under the influence of a catarrhal inflammation they may show distinctly. The normal mucous membrane of the posterior urethra is brighter red in color than that of the anterior and exhibits numerous small thin folds as the endoscope is drawn slowly out. The verumontanum offers points of particular interest. Its dimensions

vary greatly in different individuals. It projects from the lower wall of the canal as a reddish-yellow protuberance; the prostatic ducts and the ejaculatory canals open at its sides.

ANOMALIES OF THE URETHRA.

Imperforate Urethra.—Atresia of the urethra may produce foetal death or result in a urinary fistula with spontaneous relief. The distension of the bladder, associated colicky pains and the impossibility of introducing an instrument into the bladder are diagnostic of this condition. When the atresia is near the meatus, it can be perforated and the urethral canal opened with a trocar and canula, a small probe or tenotome; when deeper, an endeavor should be made to force a small sound through the closed part of the canal. If unsuccessful, an external urethrotomy or supra-pubic cystotomy with retro-catheterization of the urethra will be required.

Congenital Urethral Strictures.—These are not infrequent and may produce dribbling of urine, frequent micturition, urinary retention, dilatation of the bladder, colicky pains, prostatic hyperæmia and hypertrophy, a prolonged gonorrhœal urethritis, etc. They should be divided by a proper urethrotomy and followed by systematic dilatation of the urethra as advised for organic urethral stricture.

Valvular Folds of the Urethra.—They are best divided through the urethroscope with the author's urethral scissors.

Pouches of the Urethra.—These are often due to lack of proper development of the spongy tissue around the canal; during micturition they may become greatly distended. They should be laid open by two semicircular external incisions and the mucous membrane and skin separately sutured.

Diverticulæ of the Urethra.—They may attain considerable size and length and require division with the urethral scissors.

Double Urethra.—This anomaly with one canal leading to the bladder, the other terminating in a blind pouch beneath

the pubes or opening into the rectum, anus or prostate, have been reported; the urethra may be short and connect the bladder with the rectum.

Hypospadias (*ὑπό*, under, and *σπᾶδω*, to open).—This signifies congenital non-development of the floor of the male urethra, the canal terminating at some point in the lower wall of the urethra instead of in the glans penis. It is one of the most frequent malformations of the male genitalia and happens once in about 1,500 male births. There are three varieties, the balanitic, penile and scroto-perineal. The balanitic is the most common, the urethra terminating in a small groove below the glans, the flaring walls of which are formed by the upper wall and sides of the fossa navicularis, the mucous membrane of the urethra being continuous with the adjacent integument and glans. The frenum preputii is absent and the glans penis is often bifid. In the penile variety the urethra ends in a small, moist, slit-like opening on the under surface of the penis. Between the hypospadiac opening and the end of the penis the urethra is generally impervious or absent. The penis is usually deficient in size. It may be partly buried in the scrotal tissues or there may be a varying degree of adhesion of the penis to the scrotum. The malformation is due to a lack of development of the under surface of the corpus spongiosum. The fibrous sheath of the penis is generally somewhat shortened and thickened, producing a varying degree of downward curvature. In the scroto-perineal variety the penis is always undeveloped, the scrotum cleft, the urethra opening upon the perineum; the testicles may be undeveloped or undescended. The balanitic variety does not produce much inconvenience in erection, diminish sexual power or inhibit fecundation, but the direction of the urinary stream is changed, necessitating the elevation of the penis during micturition to overcome the downward direction of the stream. The penile variety may occasion imperfect

erections, uncertain power of impregnation and greatly inconvenience micturition. The scroto-perineal hypospadias necessitates a sitting posture to urinate; erections and sexual power are imperfect, if not absent; erythema of the scrotum is of frequent occurrence.

Treatment.—The balanitic variety rarely requires surgical attention except for cosmetic reasons. If, however, for any cause, it is considered advisable, one of the following methods of operation have in the past been advocated: Kaufmann suggested a triangular skin flap which was sutured into the urethral orifice to maintain its calibre. Duplay, when the glans was deeply furrowed (if not, he increased the depth of the furrows by one vertical or two lateral diverging incisions), denuded the edges of the furrow of its epithelium for about an eighth of an inch and sutured the freshened surfaces over a small rubber catheter, union usually taking place in a week, the operation of uniting the old and new urethral canal being completed by freshening the approximating ends of the newly-formed and the defective canal and uniting them by direct sutures, the urine being diverted from its canal by perineal drainage for about a week.

Beck, of New York, has originated the most satisfactory method for relieving the balanitic and many of the penile varieties of hypospadias. "The length of the pars mobilis in adults amounts to eight to nine centimeters in the relaxed and fifteen to sixteen centimeters in the erect condition. This mobility of the parts in children under five years of age averages five and one-half centimeters.

"The abundance of elastic fibres that characterizes the mucous membrane of the urethra alongside its cavernous portion, may also be regarded as the expression of its enormous extensibility. If the difference of length between the erected and the relaxed penis can be regarded as fairly proportional to the degree of the extensibility of the urethra, it can be un-

derstood what a surprisingly long area may be covered with the mobilized urethra. When necessary the extensibility can still be increased by dividing the ligamentum suspensorium et fundiforme penis."

Beck was the first to appreciate and utilize this distensibility of the tissues of the penis anterior to the pre-pelvic curve ; instead of forming a new urethra, he utilized the existing one, dissecting it free and dislocating it forward so that a new canal did not need to be created, the existing urethra performing its entire function. In carrying out this principle drenching of the operative area with urine is prevented, the urine not coming in contact with the wound itself, as the internal surface of the urethra remains intact.

He describes his operation as follows : " After proper aseptic preparation of the parts an incision is made from the centre of the abnormal urethral opening through the skin over the urethra to the posterior third of the pendulous portion. At the upper end of this incision a second one, running nearly transversely through the integument, is added, while the glans is stretched upward. This incision encircles the lower third of the neck of the penis immediately below the coronary sulcus. The skin-flaps so obtained are dissected back to expose the lower third of the corpus spongiosum. While the wound margins are firmly retracted downward, the urethra, together with its corpus spongiosum (Fig. 51), is dissected in its whole length from its bed between the corpora cavernosa penis."

Having exposed the urethra freely, so that it can easily be drawn to the top of the glans, it is divided at its slit-like anterior termination ; the glans penis may be tunneled by creating two flaps, which are formed by making a lateral incision along each side of the groove. Generally there is an abundance of flap tissue, so that a portion of the internal margins of these flaps can be cut off. They must be raised so far that the dislocated urethra can be placed in the wound-bed

created by this procedure. The end of the urethra is fastened to the top of the glans with four Iodoform silk sutures of moderate strength and the flaps formed from the glans are united above. By closing the small cross-section of the skin above in the longitudinal direction the cosmetic result may still further be improved; or a double-bladed bistoury may be inserted one-quarter of an inch behind the hypo-

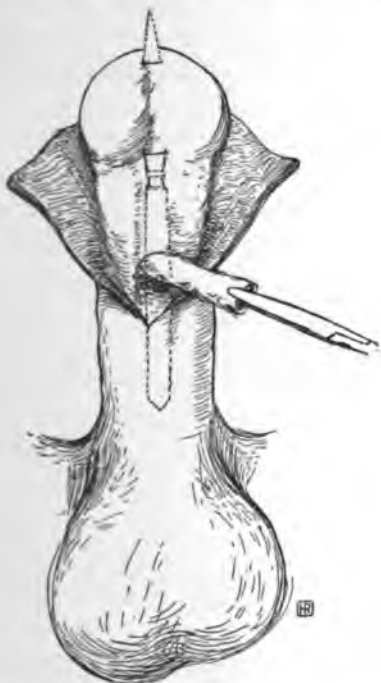


FIG. 51.—Exhibiting the Skin Flaps, the Corpus Spongiosum and the Glans Penis Pierced by the Double-bladed Bistoury. (Beck.)

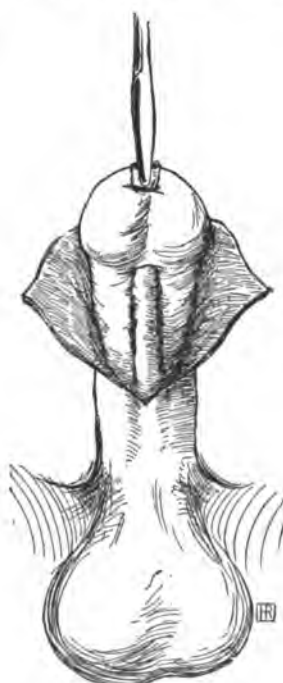


FIG. 52.—Urethra Held in Place With a Narrow Pair of Forceps. (Beck.)

spadiac sulcus and thrust from below upward through the glans parallel to the penis (Fig. 51), making a canal for the liberated urethra and also a new meatus. A long narrow pair

of forceps are passed from above downward through the **opening** (Fig. 52), the end of the urethra grasped and brought forward and united to the new meatus by four silk sutures. The flaps beneath the glans are replaced and retained in **their** normal position by interrupted silk sutures (Fig. 53). The operation is followed by considerable infiltration and on **erection** some incurvature of the penis, but this, owing to the longitudinal extensibility of the urethra, soon disappears.

Penile hypospadias, and particularly the scroto-perineal variety, have in the past been but little relieved by the surgeon's ingenuity, failure being frequent and success rare. The old operations of Duplay, Thiersch, Deffenbach, Dolban, Laurent and Van Hook are mentioned as a part of the surgical history. In all the lining membrane of the new canal was



FIG. 53.—Parts Repaired After Hypospadiac Operation With Interrupted Silk Sutures. (Beck.)

derived in one way or another by flaps from the adjoining lateral regions.

Beck was inclined to confine his method for the relief of hypospadias to the balanitic variety, for the reason that he was afraid during erection of incurvation of the penis, especially in adults. Experience has convinced him that the extraordinary extensibility of the urethra could be utilized in penile hypospadias, particularly in children, as the further off the

period of erection, the greater the extension that can be attained ; in the course of time, the urethra becomes more and more elongated and adapts itself to the new position. The only weak point in the infantile operation is the greater delicacy of the tissues which might be responsible for an injury of the urethra ; a rubber catheter, however, if well introduced into the canal will serve as a guide during the dissection of the urethra and can also be utilized as a handle and a landmark at the same time. The operation is completed by surrounding the penis with an Iodoform gauze dressing leaving a free space for the new urethra orifice. This region is then covered with compresses saturated with Burow's solution, which are frequently changed. In children the compress is fastened by a bandage.

The Nove-Josserand operation is conducted upon another principle. It may be considered the latest operation for penile hypospadias. It often necessitates a number of surgical procedures. The associated incurvature of the penis often demands attention and must be relieved by surgical technique and the union completed before an effort to lengthen the urethra is undertaken. If the penis is but slightly adhered to the scrotum a transverse incision through the peno-scrotal frenum will, when sutured so as to change the transverse liberating incision to one of a longitudinal direction, free the organ and eradicate the curvature. If the penis is embedded and concealed, being covered over with scrotal tissue, it must be dissected out and separated from the scrotum so that the latter furnishes sufficient integumental flap to thoroughly cover the penis. The loose integument of the scrotum allows a large amount of its surface to be sacrificed and the edge of the wound to be easily approximated.

The permanent chordee of the hypospadiac is generally relieved by a transverse incision carried through the under surface of the corpora cavernosa ; frequently it is necessary to

extend it through the whole thickness of the sheath, the **erectile** tissue being carefully avoided. If this does not **permit** the penis to be straightened, it may be necessary to divide the inter-cavernous septum down to the dorsum and then **forcibly** straighten the organ. A thin splint and snug bandage should be applied to retain the penis in a somewhat over-extended position until the wound is healed. After the incurvature of the penis has been removed and the parts are thoroughly healed, a transverse incision two centimeters long is made just in front of the hypospadiac meatus exposing the subcutaneous tissue and blunt dissection is carried forward by means of a straight probe along the under surface of the penis in the subcutaneous connective tissue, separating the skin from the under surface of the penis and forming a canal which terminates at the base of the glans.

The anterior orifice of the new canal, or future meatus, is then formed by slitting up the under surface of the glans or puncturing it with a trocar or bistuory, as in the Beck operation. To obtain a lining for this canal, which will not become obliterated by adhesion or contraction, an Ollier skin graft, four centimeters wide and a little longer than the proposed canal, is taken from the inner side of the thigh (where there are no hairs) and wrapped inside out around a No. 21 F. woven catheter. The skin graft is held in its place at either end by a ligature of No. 00 catgut, one or more intermediate ligatures being used as may be deemed necessary. Rochet takes the flap from the scrotum with the base at the hypospadiac urethral orifice. This modification of the operation eliminates the question of fistula and union between the old and new urethras. The catheter covered with the skin graft is then drawn through the canal or opening formed by the probe along the under and anterior part of the penis. When the graft is in place the anterior ligature is cut and its edges are sutured to the opening in the glans penis, forming a new

meatus urinarius. If the skin graft is taken from the thigh, the ends of the catheter are cut moderately close and a snug dressing applied to hold the penis in the correct position until union is complete; continuous urethral catheterization is established for evacuation of the urine and to prevent soiling of the wound. In the Rochet modification the catheter encircled by the skin graft is employed for continuous drainage. As the catheter sometimes excites much urethral irritation, which may necessitate its removal before proper healing of the parts has occurred, evacuation of the urine by continuous perineal drainage insures better results than when urethral catheterization is employed. When the original operation is performed, the catheter is removed on the eighth day to prevent contraction of the new-formed tissue; five days later a full-sized, Thompson, curved, silver sound is introduced and dilatation of the canal every four days for a month instituted. When it is impossible to employ the Rochet modification of the operation, after the new canal is formed, the adjacent ends of the old and new canals are denuded and sutured together over a small, soft rubber catheter. If perineal drainage is neglected, urinary infiltration and fistulæ at the point of union of the old and new canals are frequent. In perineal hypospadias, which permit of surgical relief, the operation should be conducted upon lines similar to that of penile hypospadias, being modified as the case may seem to make it advisable.

Epispadias.—This term signifies a deficiency in the roof of the urethra, with ectopia of the canal; it is often associated with exstrophy of the bladder, and happens about once in fifty thousand male births. The malformation may be confined to the glans and part of the penile portion, or extend along the entire length of the penis. The clinical history depends upon the degree of the deformity. The urethral orifice is generally voluminous and not infrequently the finger of the surgeon will pass easily through it into the bladder, the

prepuce appearing as a rounded mass of loose tissue below the glans. The penis may be short and thick or small and more or less deviated, it is usually attached by its under surface to the scrotum, or may even be buried in its tissues. The cause of this malformation remains as yet undiscovered though numerous speculative reasons have been advanced as to how the corpus spongiosum gets above the corpora cavernosa, together with the faulty development. Some epispadiacs urinate voluntarily with a misdirected stream; others are annoyed by frequent calls to micturition or by incontinence. There may be continued dribbling. Want of urinary control often exists except when lying on the back. The sexual act is generally difficult or impossible.



FIG. 54.



FIG. 55.



FIG. 56.

Treatment.—In this condition as well as in hypospadias the best results may be expected by the employment of some modification of the Nove-Josserand operation. When the sphincter is entirely lost, even when there is not present a true exstrophy of the bladder, the only relief which can be

given these unhappy mortals is what can be acquired by the use of a rubber urinal (Figs. 54, 55 and 56).

INJURIES OF THE URETHRA.

Wounds of the Urethra.—These may be surgical, accidental, punctured, incised, transverse or longitudinal. Punctured wounds of the urethra generally heal readily. They should be irrigated after each urination with a mild antiseptic solution, such as Permanganate of potash, 1-5000, and, if the injury has been extensive, the urine should be evacuated by the catheter for one to ten days.

Incised wounds, if large, involving the skin, and the urine is aseptic, should be surgically closed, the mucous membrane being united by buried catgut and the skin by silk-worm sutures; if the urine is septic, continuous perineal drainage must be instituted and continued for from two to four days and the wound allowed to heal by granulation. When the urethra is completely divided, transversely or obliquely, the ends should, if possible, be approximated by buried catgut sutures. Urinary infiltration must be guarded against, and, if it occurs, must have appropriate treatment. The systematic after-treatment with the sound should not be forgotten; it may be necessary, on account of the traumatic scar which may follow, to continue its use throughout life. Longitudinal incisions of the urethra are not followed by stricture.

Rupture of the Anterior Urethra may be due to a kick or a blow landing upon the parts, to the penis being shut in the drawer of a cabinet, etc. Rupture of the urethra, however, is uncommon unless the organ is forcibly bent during a state of erection, as may occur when attempting coitus while intoxicated, or forcibly straightening the organ during a chordee. Guyon says slight tears occurring during coitus, perhaps not noticed at the time, are often followed by traumatic stricture. In the bulbous urethra rupture may be due to the body falling

astride some resisting object, or when a force is in any way applied to the perineum which pushes the urethra against the peri-urethral tissues with sufficient power to break the continuity of the urethral wall—allowing of urinary extravasation into the surrounding tissues—producing impeded urination with the appearance of a hard, tender, tumefied mass in the perineum, often with urinary retention, and accompanied by a varying degree of shock. Urethrorrhagia is a constant symptom; it occurs independently of the act of micturition; when associated with hæmaturia it suggests rupture of the prostatic urethra. The act of micturition may vary from a slight hesitancy in commencing the act, due to pain, to complete retention, due to contraction of the ruptured urethra or spasm of the compressor urethræ muscle, rarely to a hæmatoma. Sometimes urinary suppression occurs; this, however, does not usually happen until general infection is established. At the point of rupture, tumefaction occurs, primarily due to extravasation of blood, later to urinary infiltration, pus, etc. In the majority of neglected cases, infection, suppuration and gangrene follow. When pus forms it burrows forward into the scrotum and backward at the side of the urethra, and, if not liberated, opens at various points in the perineum. After a perineal injury, a varying amount of urethral hæmorrhage, retention of urine and vesical distension, with pain increasing with the distension of the bladder occur and are characteristic. When the bladder is empty the question as to a possible urinary suppression or rupture of the bladder must be considered. Fever will not be present if the kidneys continue to perform their function unless sepsis occurs, when a temperature of 105° to 106° Fahr. is not uncommon, with sudden rise and fall of temperature, together with profuse perspiration. The fever of suppression, on the contrary, is moderate, accompanied with flushed face, dry tongue and other uræmic symptoms. Rupture of the urethra, if not fatal, always results in a certain degree of traumatic urethral stricture.

Treatment.—When there is no urinary infiltration or retention, rest with cold applications to the parts and the internal administration of Urotropin or Helmatol are sometimes efficacious if the rupture is in the deep urethra, and generally all sufficient if it is in the anterior portion. When hæmorrhage and urinary infiltration or retention follow injury of the deep urethra, an immediate external urethrotomy or perineal section becomes necessary. Catheterization is contra-indicated. Radical surgical relief should be early employed. After the necessary aseptic preparations an attempt should be made to introduce a moderate sized steel sound, which, if successful, should be retained in position by an assistant while the patient is placed in the lithotomy position. If failure results the parts should not be further lacerated by attempts at introducing an instrument into the bladder, but a perineal incision opening down to the end of a full-sized steel sound, and dividing the urethra longitudinally down to the ruptured portion, should be made. Just above the lowest point of the urethral ruptured silk ligatures should be introduced on each side of the incision including the urethral wall and some of the peri-urethral tissues. Lateral traction made on these ligatures often brings the ends of the divided canal into view and allows of the introduction of a sound or probe into the bladder. When the urethra is completely divided, the tendency is for the distal end to retract, and often it is impossible to locate it until a supra-pubic cystotomy is performed and the parts located by retro-catheterization. After the divided urethral ends are discovered, if they are only partially severed and the urine is aseptic they may be reunited by buried catgut sutures, a catheter being previously introduced which should remain as a support to the canal and allow of continuous drainage. When, however, the injury has been extensive and infection has occurred or there is evidence of the presence of cystitis, the separated urethral ends should be reunited with catgut only on the sup-

erior and lateral aspects of the canal, a 35 to 40 F. **perineal** drainage tube passed into the bladder and a catheter of **moderate** size introduced and retained in the anterior portion of the canal. Around these two tubes the urethra should be re-united with catgut sutures, and the perineal opening closed with silk-worm gut. During the period vesical drainage is maintained, the bladder should be douched daily with a **warm** saturated aqueous solution of Boric acid, Borolyptol, 1-20; Potassium permanganate, 1-5000, or Bichloride of mercury, 1-20,000. The drainage tube should be removed in from **five** to eight days, and the weekly introduction of urethral sounds commenced in about two weeks. If there has been extensive extravasation of urine, or when infection is present, free incisions must be made for general drainage, vesical drainage instituted, followed by an operation for deep urethral stricture.

FISTULA OF THE URETHRA.

Urethro-Penile Fistulæ from urinary abscesses are very uncommon; they may follow peri-urethral abscesses of gonorrhoeal origin, or result from deep ulcerations of a chancroidal or epitheliomatous nature. They may be traumatic or congenital. The amount of urinary leakage depends on the size of the opening.

Treatment.—When the fistulous canal is small the application of the thermo-cautery, a small wire being used, may be successful, though it is generally more satisfactory to freshen the surfaces of the sinuses and close by pin or other suture. Continuous urethral or perineal drainage will be necessary for six to eight days.

Urethro-Scrotal and Perineal Fistulæ are generally the sequellæ of urinary extravasations caused by strictures of the urethra or abscesses of the prostate or Cowper's glands, which have discharged both into the urethra and upon the external surface; sometimes they result from accidental or surgical

traumatism. These fistulæ are generally tortuous, branched and irregular; if old, their walls may feel like cords and be coated internally with calcareous deposits. The urethral opening is usually single and the cutaneous openings numerous. Urinary leakage is often present. A probe passed through the sinus can generally be made to touch a sound in the urethra.

Treatment.—External urethrotomy, curettement, cauterization or removal of the fistulous tract, removal of foreign bodies and diseased tissues, with continuous drainage and surgical dressings as required.

Urethro-Rectal Fistulæ are usually caused by peri-prostatic abscesses, or by cancerous or tuberculous ulcerations in this neighborhood. They may be of traumatic origin, especially after prostatectomy. The urethral opening is generally located in the prostatic urethra at one side of the veru montanum, occasionally in the membranous portion of the canal and at a higher level than the rectal opening, so that the urine is discharged more readily into the rectum than the fæces into the bladder. If the rectum is tolerant of the urine it is discharged unnoticed with the fæces; if not, the urine irritates and causes frequent and painful stools. Seminal fluid may also be discharged with the stool. Voiding of flatus or fæces per urethra confirms the diagnosis.

Treatment.—Continuous urethral, perineal or supra-pubic drainage of the bladder, with frequent flushing of the rectum may be employed. Surgical closure is always advisable.

Urethro-Abdominal Fistulæ may be the result of accidental or surgical traumatism, or of rupture of the urethra behind a stricture, which allows the urine to find its way behind the triangular ligament into the pelvic cellular tissues, where, when it does not cause immediate death from suppuration, it may burrow to any part of the abdominal wall and open. The external opening may be on the side, the back, the front of the abdomen as high as the umbilicus, in the groin above Poupart's ligament, on the thighs, etc.

Treatment.—Proper urinary drainage and such attention to the fistula as seems surgically adapted to the case.

Urethro-Cowper's Fistula.—In a case of the author's the fistula was due to an overlooked abscess of Cowper's gland, which followed a long bicycle ride. For one year the accompanying urethral discharge from the deep fistula was treated for gonorrhœa. Removal of the diseased gland and fistulous tract resulted in immediate cure.

DISEASES OF THE URETHRA.

Urethritis.—Any variety of inflammation of the urethral mucous membrane constitutes a urethritis, but a urethral inflammation is not necessarily an evidence of a gonorrhœal infection. Urethritis generally presents as its most significant symptom a discharge from the meatus urinarius of a mucoid, purulent or bloody character. A muco-purulent discharge from the urethra may, however, occur, as in spermato-cystitis or chronic catarrhal prostatitis, without urethral inflammation. Again a posterior urethritis may exist with perfect dryness of the anterior portion of the urethra. In the latter condition the inflammatory exudate flows backward into the bladder and contaminates the urine, being prevented from flowing anteriorly and appearing at the meatus by the spasmodic contraction of the cut-off muscle. Furthermore, if the urethral discharge is thick and viscid it may remain in the posterior urethra until voided with the urine. Urethritis may be simple or specific in origin. There are eight varieties, as follows: Those caused by the presence of micro-organisms other than the gonococcus of Neisser (bacterial), by chemical irritation (chemical), by toxins elaborated by the micro-organisms present in the urethra (toxic), by injury to the canal (traumatic), by the presence of the gonococcus of Neisser (gonorrhœal), of the tubercular bacillus (tubercular), a chancroid (chancroidal), and of a syphilitic lesion (syphilitic). All may be acute

or chronic in character. The lesion may be limited to the anterior or the posterior urethra or the whole canal may be involved. Therefore, a urethritis may be either non-specific, specific or tubercular in origin, anterior, posterior or general in location, acute or chronic in nature.

Acute Non-Specific Urethritis.—**Etiology.**—The causes of simple catarrhal urethritis are numerous. They may exist in the patient himself (predisposing) as exemplified in rheumatism, gout, lithæmia, etc., where the urine at times becomes surcharged with the products of these conditions, which in their exit in the urine, both mechanically and chemically, irritate the urethral mucous membrane, lowering its power of resistance and predisposing to infection. In a similar manner irritating products may be caused by over-eating and over-indulgence in alcohol (urethritis ab ingestis). It may have its origin in sexual excesses and abuse, especially in those suffering from some chronic disease of the genito-urinary tract (bastard or recurrent gonorrhœa). The exciting causes include injury to the mucous membrane from the careless use of instruments, passing of foreign bodies into or through the urethra (traumatic urethritis), the presence in the urethra of non-specific micro-organisms, as the bacilli coli communi, which, journeying through the kidneys, pass with the urinary stream into the urethral canal; it may be due to contact with leucorrhœal, menstrual or lochial discharges, etc. (bacterial urethritis); toxins due to microbic activity (toxic urethritis), or irritation from chemical agents, such as improper or ill-advised injections, etc. (chemical urethritis). It has been known to follow after a severe general burn, without any assignable source, or to be of an herpetic or eruptive nature (herpetic or eruptive urethritis).

Pathological Anatomy.—A portion only or the whole of the urethral mucous membrane may be involved; on endoscopic examination it appears reddened, swollen and bathed in muco-pus. The neighboring tissues may be in-

volved, inducing the formation of new connective tissue and possibly abscesses. The special pathology differs in no way from an ordinary catarrhal inflammation involving other mucous membranes.

Clinical History.—A simple non-specific urethritis may, aside from the muco-purulent discharge, present very few symptoms, or it may assume all the intensity of a virulent gonorrhœal inflammation and require microscopical examination for differentiation. The urethral discharge appears usually within a few hours after the indiscretion or some of the exciting causes already mentioned. This discharge may be slight or profuse and purulent. The lips of the meatus usually remain about normal, though they may become swollen and everted. With the appearance of the discharge there is some associated sense of uneasiness in the fossa navicularis. If the inflammation becomes excessive, there may be swelling and tenderness of the organ, phimosis, paraphimosis, thickening of the lymphatics, etc. Micturition is often increased in frequency and accompanied by slight burning and smarting; sometimes it is attended with urging and tenesmus. When the anterior urethra only is involved a slight halting of the urinary stream as it arrives at the inflammatory area is sometimes noticed, giving to the patient the idea that a stricture is forming. If the posterior urethra is invaded, there will be a varying degree of uneasiness, weight and pressure in the supra-pubic, perineal or rectal region. In the more chronic form these clinical signs may not be present except when from some indiscretion exacerbations occur. When it is necessary to determine the exact location of the urethral inflammation the two- or three-glass test should always be employed. The urethroscope is contra-indicated. The first three ounces of urine voided will practically contain all the discharge lodged in the urethra, while the second, unless it has been contaminated by a backflow from a posterior

urethritis, will be quite clear. If the second three ounces appear as if they contained Indian meal, and cystitis is not present, it indicates involvement of the posterior urethra. When in doubt, a third glass should be used for the last two ounces voided; this will contain, when the posterior urethra is involved, a small amount of blood or pus discharged by the spasmodic closure of the prostatic-vesical tissues.

Prognosis.—Simple urethritis yields readily to treatment. A large percentage of these cases are dependent upon a patch of damaged urethral mucous membrane which will remain after apparent cure and require appropriate treatment to prevent a repetition of the trouble. A microscopical examination of the discharge must always be made, as the measures sufficient to subjugate a simple urethritis will usually have no effect on one which is specific, while the proper treatment for one of the specific varieties would be ill-advised for a simple urethritis.

Treatment.—When a simple urethral inflammation is a symptom of some general dyscrasia or chronic disease of the genito-urinary apparatus, the treatment must be directed primarily to the cause. The local condition must, however, not be overlooked. If it is situated in the anterior urethra and is of any severity, beneficial results may follow from the irrigation of the canal, three times a day, with warm aqueous solution of Bichloride of mercury, 1-10,000, or Permanganate of potash, 1-5000, or a mild astringent injection. When the inflammatory focus is in the posterior urethra, instillations of an aqueous solution of Nitrate of silver, 1 to 1000, or Sulphate of thallium (1 per cent.), every second or third day, may relieve. If there is involvement of the deep genitalia, instillations are generally contra-indicated.

Acute urethritis, due to a chronic urethral lesion and known as recurrent or relapsing urethritis, responds quickly to cleanliness, mild antiseptic injections and the exhibition of

the indicated remedy. The patient should be informed of the probable condition of his urethra, and, after the subsidence of the acute exacerbation, caused generally by some sexual or alcoholic excess, he should present himself for a thorough examination and the institution of treatment necessary to eradicate any existing chronic lesion. The homœopathic remedy alone will often quickly cure a non-specific urethritis; in the author's experience, however, the time required to bring about a cure is shortened and the result obtained more satisfactory when the remedy is assisted by proper local toilet and cleansing.

Acute Gonorrhœal Urethritis, commonly known as gonorrhœa ("γονος," a flow of semen), or "clap" (old Saxon), is the most frequent disease which invades the urethra, and is the most contagious of all venereal diseases. It has a varying period of incubation, an indefinite course and is intensely virulent and contagious in all its stages. The exciting cause is the invasion and infection of the urethral mucous membrane by the gonococcus or a discharge containing it. All the causes which predispose to simple urethritis render the urethra more susceptible to gonorrhœal infection; a perfectly normal mucous membrane is in no way immune. Free indulgence in promiscuous intercourse during a debauch, with accompanying neglect of the proper toilet, are præeminent predisposing causes. The usual source of infection is intercourse with an individual already infected, but, when the extreme virulence of the gonorrhœal germ is considered, it cannot be denied that infection may be innocent in origin, as when the gonococcus is conveyed to the mucous membrane of the urethra by the clothing or unclean instruments. The general use of public closets by those having a profuse urethral discharge must needs be followed, unless proper precaution be observed, by the deposit of a portion of the infecting discharge upon that section of the seat with

which the meatus of the next occupant is in the ordinary course of events apt to come in contact, unless the second party uses unusual care to prevent it. Such reputed origins certainly demand attention if not belief, while those said to be due to strain or excessive sexual indulgence, except as the exciting agency of auto-infection in a urethral canal already the seat of a slumbering chronic gonorrhœa, are not to be considered.

Neisser, of Breslau, in 1879, announced his discovery of the gonococcus, and claimed it to be the exciting cause of gonorrhœa. Since then his views have been generally accepted. The presence of the gonococcus in a urethral discharge is considered proof positive of the existence of gonorrhœal infection; if its presence cannot be demonstrated after careful examination, some other origin of the urethritis must be considered. The gonococci appear as diplococci in pairs or in groups of four and average $1.25\ \mu$ in their long diameters, the interspace between the pairs equals about one-half the short diameter of the coccus. They resemble various other diplococci present in the urethra from which they can only be differentiated by certain methods of staining and counter-staining. The gonococci exist both within and outside of the pus and epithelial cells, those within the cells being arranged regularly while those situated externally may have an irregular grouping. A simple method of staining, suitable for the immediate needs of office practice, but which must in case of doubt be verified through more precise technique, is to place a minute portion of the discharge taken from within the urethral canal (not that squeezed out by pressure and appearing at the meatus) with a sterilized platinum wire hooked at one end, upon a glass slide, placing another slide over this and then drawing the two carefully apart. After drying in the air, or by passing carefully over a flame, the preparation is "fixed" by passing it through a flame three times. It should

then be immersed in a weak solution of Methylene blue for a few seconds, after which it must be washed, dried in the air, a drop of cedar oil placed directly upon it (no cover glass being necessary unless the specimen is to be saved) and examined through the 1-12 oil immersion lens. To stain by Gram's method the slide or cover should be dried in the air, "fixed" and placed in a saturated alcoholic solution of Gentian violet, ten parts, with ninety parts of a 2 per cent. Carbolyzed water, or better a saturated solution of Methylene violet made with 2.5 per cent. Carbolyzed water. After the specimen has remained a few minutes it should be removed and dried by absorbing the excess of fluid with filter paper (not washed), placed for one and one-half minutes in an Iodine-Kali iodide solution (Iodine, one part; Potassium iodide, two parts; water, three hundred parts), or until the preparation becomes quite dark, then washed or immersed in alcohol and allowed to remain until it becomes pale gray, finally washed in a stream of water, dried and mounted in Canada balsam. The stain will be removed from the gonococci and retained by the other diplococci. Counter- or contrast-staining with Bismark brown or Victoria blue is necessary to bring the gonococci into prominence. Before placing the specimen in the counter-staining solution the preparation must be washed in water and dried.

Pathological Anatomy.—In acute gonorrhoeal urethritis the urethral mucous membrane, if examined through the endoscope, appears inflamed and swollen, the follicles and glands prominent with an occasional erosion about the orifices of Littre's follicles.

Germs of infection, mingled with some discharge or secretion, having been deposited upon the mucous membrane at the meatus, gradually multiply upon and within the stratified pavement epithelium of the fossa navicularis. They rarely penetrate to any great degree between the individual epithe-

lium of this region, which is not favorable to their rapid extension. In from five to seven days, by multiplication, the area of infection extends beyond the fossa navicularis and involves the cylindrical epithelium of the penile portion. This variety of epithelia is not inimical to the proliferation of the gonococci, hence they not only readily penetrate the epithelium, but burrow between the epithelial cells and finally reach the connective tissue layer of the urethral wall.

The epithelium invaded by the gonococci soon undergoes mucoid degeneration and desquamation; the toxins elaborated by the gonococci further irritate the mucous membrane and induce reactive inflammation with consequent dilatation of the blood-vessels of the sub-epithelial connective tissues, extravasation of blood serum and diapedesis of the blood corpuscles. Polynuclear leucocytes are liberated in large numbers, which, migrating towards the surface of the mucous membrane, penetrate the epithelial cells and intercellular spaces. With the advent of the leucocytes, the gonococci cease to further penetrate and invade the urethral wall, as they can more readily obtain nutrition from the white blood cells than from the urethral epithelium, consequently they attack, penetrate and merge themselves into the bodies of the leucocytes. The leucocytes or pus cells, however, continue to push forward to the surface of the mucous membrane and are finally discharged in creamy drops from the meatus or are washed away in the urinary stream. In this manner nature eliminates the invading germs, and by extravasation and diapedesis actively resists the onward progress of the disease. In an untreated gonorrhœal invasion of a urethra free from congenital and acquired defects this pathological condition will continue and increase for about two weeks. On the eve of the third week the blood-vessels of the connective tissue become greatly dilated, and, while the discharge of serum and white blood corpuscles continues profuse, the

gonococci will have largely disappeared, though present upon the surface or within the walls, of the new epithelium. By nature's dictation for self-preservation, this epithelium is being transformed into a stratified pavement epithelium. The urethral discharge, which, up to this period has been profuse, purulent, bloody and accompanied by painful urination and erections, now becomes thin and milky. Microscopic examination shows it to be composed of leucocytes and epithelial cells impregnated with gonococci floating in the blood serum, the epithelial cells not only being filled with the gonococci, but encircled by myriads of them. Nature's repair, if not prevented by accident or ill-advised treatment, usually progresses rapidly and complete recovery may be expected in six or eight weeks.

This happy termination is, however, unfortunately rare. Auto-infection following some indiscretion of diet, coitus, sexual excitement, etc., causes further exudation of serum and leucocytes, separation of the newly-formed epithelial cells, the formation of crevices in the urethral wall and a new gonococcal invasion. With each auto-infection the infected parts lose some of their resisting and expulsive powers, and if the disease is not corrected by proper treatment, the urethra may finally accommodate itself to the condition and permanently tolerate the presence of a varying number of gonococci. This termination induces connective tissue proliferation and its infiltration by the mono-nuclear cells, a condition known as a chronic gonorrhœal lesion. Abrasions of the mucous membrane occur when the inflammatory action is severe. They may heal or remain and cause a chronic discharge.

The original location of the infection may be at the meatus, in the fossa navicularis or further back in the canal. During a gonorrhœal urethritis the gonococci often travel up the minute ducts which open into the urethra, inducing lesions of the urethral, Cowper's or the ejaculatory ducts and their

deep connections, in which locations the disease may persist indefinitely, even after the urethra has seemingly returned to its normal condition. These imprisoned gonococci often, both from recognized and unrecognized causes, take on a new activity, multiply and break forth into the canal, inducing a seemingly new urethritis. This constitutes what is known as "latent" gonorrhœa.

Goll, who has investigated this subject, reports the discovery of gonococci in the urethras of male subjects as long as three to seven years after supposed cures, a fact which will account for some of the mysterious gonorrhœas and infections of the past.

During any stage of the urethral inflammation, if severe, the gonococci may pass by direct continuity of tissue at any point between the fossa navicularis and the triangular ligament, to the deeper structures extending to and involving the corpus spongiosum. The accompanying plastic exudate, which is thrown out, glues together the meshes of the tissue of the corpus spongiosum, interfering with its elasticity and preventing the blood from passing in and distending it during erection; hence, while the corpora cavernosa may respond to the stimulus of erection, the corpus spongiosum remains unexpanded and acts like the string of a bow, giving rise to the exquisitely painful condition known as "chordee." When the connective tissue underlying the sub-mucous tissue of the urethra, the corpora cavernosa or the corpus spongiosum becomes involved new connective tissue develops and abscesses may result. The associated inguinal glands may become swollen and inflamed and a suppurative adenitis result. The lymphatic vessels on the dorsum of the penis sometimes become involved and stand out like cords under the skin.

Clinical History.—The period between the exposure to and contact with the contagious material and the appearance of the urethral symptoms varies from a few hours to two or three

weeks, the average period being from three to eight days. When the period is shortened it is often conditioned by an antecedent simple urethritis; when the incubation period is lengthened to ten to thirty days the infection generally originates from a woman suffering with a latent gonorrhœa, the slow development being attributed to the attenuated character of the contagious principle in the micro-organism, or to the great resistance of the individual urethra.

The day previous to the appearance of the urethral discharge, the mind often involuntarily centres upon the penis, sexual erethism increases and there is often slight heat and fulness in the penis, with itching in the meatus or on the glans penis, which may be sufficient to prompt frequent and anxious inspection of the parts. Rapidly the tickling, crawling and itching at the meatus urinarius increases. The lips of the meatus become somewhat swollen and glued together. Micturition is increased in frequency and is accompanied by some degree of burning. During the next twenty-four hours a slight, sticky, bluish, milky discharge appears, the lips of the meatus become oedematous, everted and of a pinkish hue. The next ten days to two weeks constitutes the advancing stage of the disease, the inflammation travels backward along the anterior urethra, the symptoms rapidly multiply and increase in intensity, depending upon the degree of virulence of the gonococci and the vulnerability of the individual urethral mucous membrane, the first forty-eight hours being characterized by the discharge becoming profuse and purulent. Sometimes, owing to the admixture of blood, resulting from the rupture of over-distended vessels in the inflamed area, it becomes yellowish-green or green. The hæmorrhage may be sufficient to make the discharge distinctly bloody. Micturition becomes frequent and painful, the act being preceded, accompanied and followed by burning and smarting, sometimes by the discharge of a little blood. The pain is referred

particular to the meatus and the fossa navicularis. Retention of urine may occur as a result of the inflammatory swelling, especially if carousing and alcoholic indulgence are not discontinued. The penis and urethra become sore, painful and sensitive to the pressure of the clothing or handling, and often the inflamed and swollen glands and follicles beneath the urethra produce a seeming nodular condition of the canal. Sharp cutting, stabbing pains along the canal and behind the glans are common, often being accompanied by pains in the testicles, spermatic cords, perineum and back. The special symptoms are accompanied by a varying degree of balanoposthitis, phimosis, paraphimosis, and engorgement and enlargement of the lymphatics, particularly those located on the dorsum of the penis.

As the inflammatory condition becomes more extensive, erections grow more persistent and painful, constituting one of the most harassing symptoms of the disease. Chordee is present to a varying degree in all cases of gonorrhœa, and while it may happen at any time, it is particularly pronounced at night, and by its persistence makes the sleeping hours intolerable.

The local symptoms, are frequently accompanied by slight chilliness, fever, loss of appetite and often extreme mental depression, due to toxins derived from the suppurative areas. The gonococci traveling or being forced backward by instruments or ill-advised injections and irrigations may involve the peri-urethral glands, the glands of Cowper, the prostatic urethra, the bladder, the testes, the prostate, the seminal vesicles, or being absorbed may cause congestion of the conjunctiva, gonorrhœal rheumatism, etc. These complications are not uncommon during the second or third week of the disease. During the active stage of a resultant epididymo-orchitis, acute prostatitis, spermato-cystitis and cystitis, the discharge from the anterior urethra generally ceases, to again return when the complication declines.

The posterior urethra is involved to a varying degree in the majority of all gonorrhœal invasions of the urethra, conditioned generally by some indiscretion, such as excessive physical exercise, indulgence in beverages containing alcohol, coitus, etc., from ill-advised treatment such as strong injections, neglect of proper treatment and improper urethral instrumentation. The immunity of the posterior urethra is due to the scarcity of urethral glands and to the gonococci being carried out during each micturition by the rapid flush of urine. In some cases it develops without apparent cause, even when the greatest care has been observed. Posterior urethritis may appear as early as the fifth to the seventh day, though when it happens it usually manifests itself during the third week of the disease. Posterior urethritis is characterized by symptoms of frequent and imperative urging to micturate, accompanied by severe burning and tenesmus. It may be almost continuous and unbearable. Possibly only a few drops of bloody urine may be voided. Entire control of the urine may be lost or retention may occur. The inflammation and spasmodic contraction of the muscles of the deep urethra are often so intense and continuous that the purulent discharge from the urethra is prevented from flowing forward. This tonic contraction of the compressor urethræ muscle compels all the discharge to flow back into the bladder, where mingling with the urine it gives it a mealy appearance.

At the end of the act of micturition a few drops of blood are often voided; it may be quite profuse. Between the acts of micturition the blood may flow back into the bladder and mix with the urine. The blood is derived from the swollen, congested and often eroded prostatic urethra, which is squeezed at the termination of each urinary act by the irritated compressor urethræ muscle.

The muscular spasm is often almost unbearable, and is usually accompanied by a varying degree of burning, tickling

and shooting pains in the deep urethra and rectum, which are increased by urination and defecation. Erections increase in frequency, the degree of chordee, however, depends upon the degree of involvement of the anterior urethra. Nocturnal pollutions are frequent and often quite distressing. When there are associated prostatic lesions, the urine, in addition to being cloudy from the presence of pus or red from blood, will contain a larger percentage of albumin than would be expected from the quantity of urethral blood and pus. This is due to the obstruction to the flow of urine through the ureters dependent upon the contraction of the detrusor muscles of the bladder. With involvement of the posterior urethra there is generally a decrease in quantity of the urethral discharge, often giving rise to the false hope of immediate relief. As the intensity of the inflammation subsides the muscular spasm relaxes, the posterior urethral discharge flows forward occasioning an increased volume of discharge at the meatus with relief of the urinary symptoms. Complete resolution may follow, but rarely without well-conducted treatment, and even then it may be troublesome.

The declining stage in uncomplicated gonorrhoeal urethritis commences about the end of the second week. The pain and burning on micturition with the local symptoms of the acute inflammatory involvement slowly disappear until there remains only a thin, transparent, sticky urethral discharge, a drop or glueing of the lips of the meatus visible only in the morning, finally ceasing entirely in about two months. Often, from some known or unknown reason, after the discharge has apparently ceased it will temporarily return. The majority of cases, however, owing to acquired or congenital urethral defects, do not follow an uninterrupted mild course. Exacerbations or auto-infections are common and chronic urethral lesions often follow. Fully 85 per cent. of all acute gonorrhoeal invasions of the anterior urethra are complicated

by a varying acute posterior urethritis which appears during the third week or later in the disease.

Diagnosis.—This depends upon the presence in the discharge of the gonococcus of Neisser, with the concomitant clinical symptoms. The existence of a discharge from the urethra is no evidence that it is gonorrhœal in character, as has already been stated, and even the presence of the gonococci is not an evidence that an immoral act has been recently committed, or that the party infected may not have innocently contracted the disease. A gonorrhœal urethritis generally appears in three to eight days after an impure coitus, while a simple urethritis develops within twenty-four hours after the occurrence of the exciting cause. As a rule, there is less swelling and redness of the meatus, and burning on urinating with freedom from chordee in the urethritis which is not due to the presence of the gonococcus, though undoubtedly simple urethritis may assume all the virulence of a gonorrhœal invasion and require a microscopic examination of the discharge to distinguish the character of the inflammation. Relapsing gonorrhœa and recurring urethritis are always due to a damaged urethra. The clinical symptoms are the same, *e. g.*, repeated attacks of acute urethritis from slight provocation,—a debauch or coitus—the patient generally believing that the acute attack was conditioned by an infecting partner, even though the meatus had rarely, for six months at a time, been free from some stickiness or a morning drop. The diagnostic differentiation of an acute exacerbation of a relapsing gonorrhœa or a recurrent urethritis depends upon the presence or absence of the gonococcus. These cases are differentiated from acute gonorrhœal urethritis by the absence of chordee and swelling of the meatus, the preceding genito-urinary history and rapid recovery under appropriate treatment. The types of non-specific urethral inflammation, those due to chancroid, syphilis or tuberculosis, are usually easily differentiated by the history and subsequent developments.

Prognosis.—Uncomplicated acute gonorrhœal urethritis, involving a urethra free from congenital or acquired defects, runs its course in from five to eight weeks. If the afflicted individual is willing to conscientiously follow proper methods of treatment and shun all excesses, the duration of the disease may be considerably shortened and complications be avoided.

When the invaded urethra has been absolutely normal previous to the gonorrhœal infection, a cure may occasionally, with judicious treatment and proper coöperation on the part of the patient, be accomplished in one to three weeks. Albeit, even with the best of treatment, especially if the patient is of a strumous, cachectic, gouty or rheumatic diathesis, or he is careless about treatment, hygiene and habits, is restless under the restraint of treatment, a long period will elapse before the disease can be controlled and the urine become free from shreds. Relapses, even in well-conducted cases, from exposure to cold, over-exertion, excesses at the table, sexual excitement, seminal emissions, etc., are not infrequent; they materially retard recovery, which is also to a considerable extent dependent on the general health. When a urethra is the seat of a chronic inflammatory lesion, an acute specific urethritis from auto-infection (recurrent gonorrhœa) is often seemingly cured in a few days. An acute gonorrhœa occurring in a urethra which, from repeated gonorrhœal involvement, has established a degree of tolerance, or immunity is often comparatively easily controlled. The first gonorrhœal urethritis is usually the most severe. Gonorrhœal urethritis occurring in a canal damaged by previous inflammation is usually troublesome and often cannot be entirely eradicated until the antecedent lesion or congenital defect has been removed. These overlooked lesions account for the protracted attacks in which treatment is illogically blamed for producing strictured conditions, etc., when, in

fact, the stricture antedated all urethral inflammation. Injudicious or ill-directed treatment, with continued excesses, may develop conditions which will be exceedingly uncomfortable, if not dangerous, to the patient and try all the resources of the physician to combat. Gonorrhœal urethritis may terminate in recovery, chronic urethritis, or be followed by strictures.

Some of the methods advised to demonstrate that the patient has been restored to health, as indulgence in beer or a debauch, an illicit intercourse, or both, as well as irritating the urethra by a full-sized sound or instilling a strong solution of Nitrate of silver into the urethra with the object of exciting a slight urethritis for the purpose of examining the resulting discharge for the presence of the gonococcus, is to be condemned as immoral and unscientific.

Satisfactory evidence of eradication of the gonococcus may be obtained from bacteriological research in the following manner: Three sterilized tubes for the centrifuge should be prepared; the first should be filled with the first two drachms of urine which must be voided directly into the tube by the patient; the second filled with some of the general urine which has been voided into a large sterile glass beaker; the third with the secretion obtained by massage of the prostate and seminal vesicles. The tubes are then submitted to the centrifuge and the sediments examined by means of a bacteriological culture and the microscope. Upon these evidences a positive diagnosis of the presence or absence of the gonococcus can be made without the employment of depraved acts or unnecessary urethral instrumentation.

Whenever pus exists in the genito-urinary tract the presence of the gonococcus is to be suspected. Whenever pus continues to be present in the urine of one who has had gonorrhœa and who, after every sexual or alcoholic indiscretion, suffers from a slight urethritis, it may be inferred that the gonorrhœa has not been cured. When a urethral discharge is

absent or is continuous to a slight degree, if a relapse does not follow from sexual or alcoholic dissipation the gonorrhœal character may be considered eradicated and the patient free from the infectious principle. When for a period of one month or longer after a gonorrhœa there has been no urethral discharge and the urine has continued to be clear and sparkling the patient may be considered cured and free from danger of relapse.

Janet's divisions of gonorrhœal urethritis should be remembered, as they will materially assist in forming a correct prognosis and in selecting the proper methods of treatment. First, the stage of invasion by the gonococcus; second, the anatomical and topical lesions induced by the gonococcus, and third, secondary infection.

While the diagnosis of the presence of a gonorrhœal urethritis is readily attained, the period of duration is uncertain and a prognosis as to when it will be safe for the patient to become a benedict is extremely difficult yet often very important. It must not be sanctioned until the gonococci have been entirely eliminated from the genito-urinary tract.

Treatment.—Acute uncomplicated gonorrhœal urethritis is not, when it invades a normal urethra, generally a dangerous disease, it usually responds readily to properly directed treatment, but if one so afflicted is not willing to give the same attention to this condition as he would to one of equal importance in another portion of the body he cannot expect satisfactory results. The average individual considers an attack of gonorrhœa of as little importance to his general welfare as a simple cold and that all the requisites for a cure have been completed when he presents himself for medical advice, which he may entirely ignore or modify to suit his convenience, always expecting a rapid and radical cure, and not being at all backward in denouncing his physician when the outcome is unsatisfactory. This, as well as the light way

in which the disease is spoken of by some members of the medical profession, is much to be regretted.

The successful treatment of this disease must always be conducted on lines which will make the patient comfortable, eliminate the gonococci and prevent complications. Hygienic, antiseptic and medicinal methods of relief must be selected to suit each individual. The indicated remedy must always be prescribed, as it will materially modify the course of the disease and diminish the danger of complications.

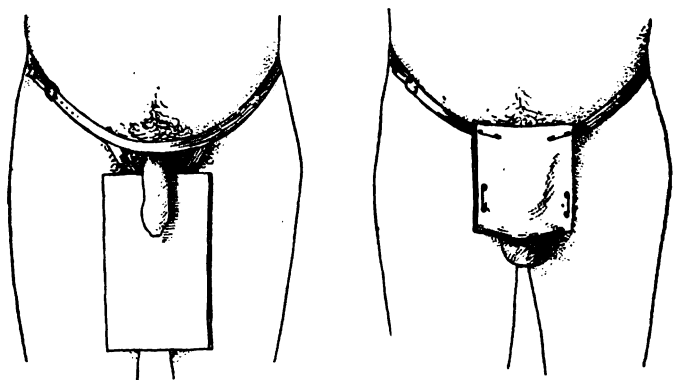
When the gonococci travel or are forced backward by improper injections, irrigations or instrumentation, and the genito-urinary system in general becomes involved, the disease assumes a grave aspect and the resulting possibilities are unlimited.

Hygienic Treatment.—Undoubtedly rest in bed until the cessation of the urethral discharge would be of the greatest assistance, and, in instances where it has been observed, the results have been exceedingly satisfactory. While absence from accustomed duties is impossible, rest must be enjoined and all overexertion avoided. Cleanliness is not only essential to personal comfort and a preventive of complications, but it is of the greatest moment to those with whom the patient may come in contact ; disregard of the proper aseptic precautions may lead to infection of the innocent. The extreme virulence of the gonorrhœal discharge calls for the observance of every possible precaution in its disposal. Particular instruction must be given not to handle the penis unnecessarily, manipulation being not only an added source of irritation, but adds another means of carrying the infection to the eye and setting up that most dreaded complication, gonorrhœal ophthalmia.

Twice a day the penis, prepuce and glans penis should be cleansed by bathing with warm water containing a little antiseptic soap, and then drying with absorbent cotton. Numer-

ous methods for protecting the clothing and catching the urethral discharge have been advocated, such as utilizing a long prepuce to retain pieces (about an inch square) of lint; Taylor recommends two layers of gauze five inches square, with an oval aperture in the centre of sufficient size to slip over the head of the glans, and retained in place by pushing the prepuce forward; others advise wrapping a piece of gauze or a few pieces of toilet paper about the penis and retaining them by twisting the loose ends, by a non-constricting rubber band or a narrow strip of adhesive plaster; a gonorrhœal bag attached to a suspensory, or wrapping the entire genitalia in an apron (of liberal size) of lint, gauze or old linen doubled and fastened to a band around the waist. The first of these methods is especially objectionable, as it prevents free drainage, retains the muco-purulent discharge within the urethra, which may lead to further infection, and predisposes to inflammatory phimosis; the others are troublesome and uncleanly. A protective dressing which combines all the good and has none of the faulty features may be adjusted as follows: A piece of borated gauze, one yard wide, is cut into seven-inch transverse strips; each strip is folded twice upon itself, making a pad of four thicknesses, seven by nine inches in size; the penis is rested on the first three inches of the pad (Fig. 57) and the remainder is drawn up over the dorsum of the penis and the sides pinned together with small safety pins (Fig. 58). The improvised bag is held in place by pinning the free end to the band of a suspensory bandage which should always be worn to support the scrotum and its contents during an attack of acute urethritis. By removing the pin at one side of the dressing, the penis can be removed to urinate without soiling the hands. When the dressing becomes soiled it should be burned or otherwise effectually disposed of and a fresh one applied. The hands must always be carefully cleansed after being in contact with the parts.

The diet must be carefully and intelligently regulated. As a rule, it should be light and non-stimulating, and consist principally of milk, bread, vegetables, fish and white meat. If the patient is ill-nourished and anæmic, a highly nitrogenous diet may be advisable. The meals should be taken at regular hours. Milk (especially skimmed) is always indicated, not only for its food value, but because it renders the urine bland. When milk disagrees, it must be shaken and a little salt added to make it more digestible and palatable. Meat once a



FIGS. 57-58.—Gonorrhoeal Dressings.

day may be allowed. Fats, pastry, strong tea or coffee, in fact all articles of food difficult of digestion and all condiments, except the simplest, are to be interdicted. Pure spring water should be taken in excess, as it dilutes the urine, renders it bland and less irritating to the diseased mucous membrane, removes the accumulated discharge and cleanses the canal; it also acts kindly by increasing the peristaltic action of the intestines. In posterior urethritis the muscular pain and tenesmus which accompany micturition often contra-indicate the excessive use of water. If the disease is not controlled

after the eighth week, a more liberal diet with coffee, wine, etc., in moderation may not only be allowed, but sometimes it is necessary to bring up the general tone of the system and facilitate the complete removal of the disease. As the normal acid urine in its exit irritates the inflamed urethral mucous membrane and causes burning and scalding on urination, it should be rendered alkaline by the administration, three times a day, of ten to fifteen grains of the Citrate, Acetate or Bicarbonate of potash, dissolved in a glass of water, or by taking, five to six times a day a glass of Vichy, in which three or four Soda mint tablets have been dissolved. A similar result can be obtained by a vegetable diet. During the acute stage, if constipation exists, and it does not yield at once to the symptomatic remedy, it should be relieved by a saline cathartic. A stated and regular number of hours for sleep should be observed. The mind should not be permitted to dwell upon or be directed toward sexual subjects. The companionship of women and others who in any way carnally excite must be avoided. Coitus must be interdicted for at least two weeks after all discharge has disappeared and treatment has been discontinued, though it is a fact that shreds in the urine sometimes do not entirely disappear until sexual relations are resumed.

Prophylactic Measures.—Undoubtedly the only absolutely safe method consists in avoiding all illegal and promiscuous coition. If copulation of a suspicious nature has occurred, the urinary stream will more effectually remove all foreign morbid material which may have been lodged in the canal, if the anterior urethra is repeatedly overdilated by sudden closure of the meatus during an immediate urination. A cover sufficiently strong to withstand rupture during the act, followed by careful bathing of the parts and urination, has also been advised.

Two drachms of a $\frac{1}{4}$ to a 1 per cent. solution of Protargol or a 5 per cent. solution of Argyrol, injected into the urethra

and retained for three minutes either immediately after copulation or three times a day after urinating, for one to three days following, has sometimes been an effectual prophylactic, even when there has been actual exposure to a gonorrhœal discharge. Frank advises, immediately after coitus, the instillation into the meatus urinarius of two drops of a solution composed of Protargol, twenty parts; Glycerine, twenty parts, and water, sixty parts, and pouring two drops over the frenum. This solution is non-irritating and kills within five seconds all gonococci with which it comes in contact. Where the foreskin is tight the preputial cavity should be cleansed with a Protargol or Argyrol solution.

The uselessness of some of the former prophylactic means, excepting their utility in washing away the offending germs, is proven by the experiments of Finger, which demonstrated that the following antiseptics applied for two minutes to cultures of gonococci did not destroy their virulence: Permanganate of potash, 1-10,000 to 1-1000; Carbolic acid, 1-10,000 to 1-1000; Corrosive sublimate with salt, 1-100,000 to 1-5000; Nitrate of silver, 1-20,000 to 1-1000. He attributed this failure to kill the gonococci to the fact that the cultures cover themselves with an albuminous coagulation when brought in contact with these antiseptics which they do not do when Protargol or Argyrol is used.

Abortive Methods.—Acute gonorrhœal urethritis is occasionally successfully aborted in the initial stage, though more often it is greatly intensified, by the intra-urethral applications of a strong antiseptic solution. Nitrate of silver, ten to sixty grains to the ounce of distilled water, is the most commonly employed. The strong silver solutions produce degeneration of the superficial layers of the infected mucous membrane and a varying degree of inflammation of the sub-mucous tissues. When employed at the proper period in the requisite strength it destroys not only the diseased tissue, but

the germs contained within it and those in the immediate vicinity. It is, however, as a rule, applied too late to be efficacious. A purulent discharge, with pouting of the lips of the meatus, contra-indicates its use. The method of application is as follows: After the patient has urinated, the part is anæsthetized by the injection into the urethra and its retention for two minutes of a 2 per cent. aqueous solution of Cocaine. This solution is prevented from flowing backward and carrying the gonococci to deeper portions of the canal by tying a catheter sufficiently tight around the root of the penis to occlude the urethra. A sufficient quantity of a twenty grain to the ounce solution of Nitrate of silver to overdistend the urethra anterior to the encircling catheter is then injected by means of a blunt-nozzled syringe and retained for



FIG. 59.—Brown's Urethral Speculum.

about one and one-half minutes. After the injection urination should be postponed as long as possible. Within a few hours a yellowish-white or bloody discharge appears at the meatus, which, if the treatment has been successful, soon becomes white and in forty-eight hours disappears; the urethra may be dilated with the Tilden-Brown wire speculum (Fig. 59), illuminated with reflected light, the affected area located; by means of an aluminum applicator, having a sufficient piece of absorbent cotton twisted around its end, the diseased area is cleansed by the application of Hydrogen peroxide in ten to fifteen volume strength, dried with cotton, and a solution of Nitrate of silver, thirty to sixty grains to the ounce, applied

to the diseased area and the tissues about one inch below and above it. It is sometimes necessary to repeat the application within twenty-four to forty-eight hours.

Local Treatment.—The various antiquated methods of local treatment recommended are too numerous to mention. The majority have been more efficacious in the practice of their sponsors than with their followers, who often observed that in many respects they were detrimental to the patient.

Irrigations or injections, to be efficacious, must possess the power to destroy and eliminate the gonococci without injuring the mucous membrane or opening new points for the entrance of the morbid principle, ease the inflammatory symptoms and prevent complications. It was formerly believed that all urethral injections were objectionable during the advancing stage. When they were deemed expedient, large quantities of a weak solution were employed to obtain the mechanical effect of cleanliness rather than the remedial action of the drug. While urethral injections and irrigations are now advised in acute urethritis, the fact remains that they should be discontinued when their use is followed by a sensation of discomfort or pain in the parts. Weak solutions should be used at first, the strength being gradually increased according to the conditions present and the reactions produced. They may be given from one to four times daily, always after urination, as they act best when the diseased membrane has been washed by the passage of the urine. The selected solution, when applied, must always be warm. This can be easily arranged by making the original solution of double strength and diluting it with hot water. Irrigations and injections should be administered with the patient sitting on the edge of a chair or reclining; they may be administered by the patient himself in the standing position. When urethral injections seem advisable, the glans penis should be held between the thumb and index finger of the left hand, slight pressure

retracting and opening wide the lips of the meatus. The syringe to be used should have a capacity of from two to four drachms, be of glass, have a smoothly-running piston and a blunt nozzle, unless the meatus is abnormally small, when one with a narrow nozzle one-half inch long should be substituted. The syringe held firmly between the thumb and middle finger of the right hand should be pressed closely into and against the meatus and the requisite quantity of the solution injected slowly and without force, care being taken not to overdistend the urethra. To prevent the escape of the solution the meatus should be compressed between the thumb and forefinger of the left hand as the syringe is withdrawn. Before using the selected solution, the urethra should be cleansed by voiding the urine or washing out the anterior urethra with several syringes full of a warm aqueous saline solution. The medicinal solution should be retained in the urethra for from ten to fifteen seconds to as many minutes, depending upon the properties of the fluid injected. Argyrol, Protargol, Argonin, Argentin, Nargol, Mercuirol and other silver preparations should be retained from three to thirty minutes; Zinc sulphate or acetate, Permanganate of potash, the vegetable astringents, Bichloride of mercury, etc., solutions about one minute.

Acute gonorrhœal urethritis is best controlled by injections into the anterior portion of the urethra of an aqueous solution of the proper strength of some one of the non-irritating preparations of silver, particularly Argyrol or Protargol. Some, however, favor urethral irrigation with Permanganate of potash. The silver salts appear to possess all the properties necessary to destroy the gonococci, relieve the inflammatory conditions and do not injure the urethral mucous membrane. Protargol is an efficient destroyer of the gonococcus, and very efficacious when employed in the early stage of gonorrhœa, but when the deep urethra and sub-mucous tissues are in-

volved, its employment is often unsatisfactory, acute prostaticitis or epididymitis frequently resulting. Protargol operates best in a 1-400 to 1-100 freshly prepared aqueous solution, one to two drachms being injected four times daily after urination and retained for from three to five minutes. Protargol acts directly upon the gonococcus and destroys its virulent power; it does not damage the mucous membrane, though it is slightly astringent. Some surgeons prefer Argonin, but, as it is often improperly prepared by the druggist, it is not generally satisfactory. Argyrol, while objectionable on account of its discoloring qualities, contains 30 per cent. of silver, is easily soluble in cold water and has no astringent or caustic properties. Urethral injections of a 2 to 5 per cent. aqueous solution administered as directed for the use of Protargol have given satisfactory results. While Protargol and Argyrol seemingly act clinically very similarly in gonorrhœal urethritis, both inhibiting the urethral symptoms, controlling the local manifestations and limiting the volume of the discharge, investigations conducted in the genito-urinary ward of the Metropolitan Hospital, in which the author was ably assisted by his senior assistant, House Surgeon Doctor P. D. Saylor, the two preparations of silver were demonstrated by microscopic examination of the discharge and clinical study to differ materially. The gonococci disappeared more rapidly during the use of Protargol, recovery being seemingly satisfactory and rapid, but after the disappearance of all symptomatic manifestations, relapses without manifest cause, were not infrequent while with Argyrol the gonococci continued present a longer period, and relapse rarely occurred. These results lead the author to the conclusion that Protargol has, in addition to its germicidal, an astringent property, through which an occasional gonococcus is imprisoned in some portion of the urethral structure where for a time it remains dormant; later becoming free, it multiplies and causes a re-infection, with the un-

pleasant and unlooked for re-establishment of the discharge. Argyrol seemingly has no astringent properties and is, therefore, generally preferable. The unpleasant discolorations which have made Argyrol so objectionable in the past are, thanks to a recent discovery of Doctor Klots, at once eradicated by the application to the soiled linen of an aqueous solution of Bichloride of mercury, 1-1000.

Treatment of gonorrhœal urethritis with the selected silver salt often causes the disappearance of the gonococcus and the subsidence of the associated urethral inflammation within four to five days, but even if microscopic examination of the discharge fails to demonstrate the presence of the gonococcus it is not advisable to discontinue the silver preparations immediately, as some of the gonococci may still remain imbedded between the epithelial cells, in the sub-mucous tissues or in the urethral ducts, which, on being liberated, if not immediately subjected to the action of a proper germicide, will cause re-infection of the canal, with return of the discharge; the injections should, therefore, be continued at less frequent intervals for a week or ten days after the gonococci have disappeared.

When the urethral discharge persists and a microscopical examination reveals the presence of streptococci or other pus-producing organisms, especially during the second or third week of a gonorrhœal urethritis treated by urethral injections of a solution of Protargol, Argonin or Argyrol, or in urethral inflammations which, apparently without cause, remain stationary, the silver preparation should be discontinued and one with germicidal and astringent properties, such as an aqueous solution of Bichloride of mercury, 1-20,000; Permanganate of potash, 1-4000, or Permanganate of zinc, 1-500 substituted. The selected solution should be injected three times a day and retained for one minute.

Urethral irrigations by means of the Valentine modification

of the Janet hydrostatic method should not, as a rule, be employed during the acute stage, except in occasional cases where a deep urethral application for some particular reason is necessary.

Irrigation of the urethra with a warm aqueous solution of Bichloride of mercury, 1-40,000 to 1-20,000, as advocated by Halstead and Brewer, of New York, or Permanganate of potash, 1-8000 to 1-500, as advised by Janet, of Paris, which produce by their mechanical action the removal of all free discharge, and by their germicidal action the destruction of micro-organisms, have many ardent advocates, particularly Valentine, of New York, and Aschcraft, of Philadelphia. Undoubtedly many are relieved by these irrigations, but relapses and resulting serious complications when they are administered by the general practitioner are common. In selected cases they are often very satisfactory, though it must be remembered that while their first effects are apparently all that can be desired, spermato-cystitis, prostatitis, epididymo-orchitis, etc., often follow, complications which possibly might have been avoided. But where the silver salts have not been used sufficiently early to prevent pronounced inflammatory symptoms, *e. g.*, an oedematous meatus and a profuse greenish-yellow discharge, hot urethral injections, probably owing greatly to their moist heat, are advantageous.

Irrigation of the urethra may be executed with a soft rubber bulb which holds about one ounce (Keyes' universal irrigator), or by the retrograde urethral method, which consists in passing a soft rubber catheter down to the bulbous portion of the urethra and connecting it with a large vesical syringe, or a fountain syringe the bag of which to give the proper force to the selected fluid is placed two feet above the level of the urethra. Irrigation can also be performed by means of a Keefer nozzle. This instrument is composed of hard rubber, having two canals, the exit being slightly the larger to prevent over-

distension by the incoming fluid. The nozzle is pressed **tightly** into the meatus and connected by the smaller channel to a fountain syringe, the height of which is regulated according to the force required.

Janet, taking advantage of the well-known fact that fluids under moderate pressure will enter the bladder through the urethra without the use of a catheter, advocated discontinuing the catheter. He introduced an irrigating apparatus, as demonstrated in the Valentine modified irrigator, which possesses many advantages over the original, especially in the movable bracket, which allows of easy elevation and depression of the reservoir to regulate the pressure. It has three cone-shaped glass nozzles, formed to correspond to the varying size and contour of the individual meatus. The nozzle is connected by means of rubber tubing to the reservoir, which should have an elevation of four feet above the level of the meatus for irrigation of the anterior urethra and five to eight feet for intra-vesical irrigation. A glass shield-bell, four inches in diameter, at the junction of the rubber tube and the glass nozzle prevents escaping fluid flowing back and soiling the hands of the operator. The stream is regulated by a cut-off attached to the tube behind the shield. In this method of treatment a gentle stream of the selected Permanganate solution at a temperature of 110° to 120° Fahr. is directed against the meatus and glans until they are thoroughly cleansed, the fluid being caught in a triangular basin or other receptacle. The nozzle is then inserted into the meatus and the solution allowed to flow into the urethra. The meatus should not be entirely occluded, but the excess of fluid should be allowed to escape and be guided into the receptacle by the glass shield. About one quart of the selected solution should be used at each irrigation. The great objections to the apparatus are that it is cumbersome and that it is difficult to protect the physician's hands and the patient's clothing, etc.

Janet tabulated his treatment as follows:

First day, first visit,	anterior irrigation,	1-2000.
First day, 7 P. M.,	" "	1-4000.
Second day, 9 A. M.,	" "	1-3000.
Second day, 7 P. M.,	" "	1-4000.
Third day, 9 A. M.,	intra-vesical	" 1-6000.
Third day, 7 P. M.,	anterior	" 1-6000.
Fourth day, 9 A. M.,	intra-vesical	" 1-3000.
Fifth day, 9 A. M.,	" "	1-3000.
Sixth day, 9 A. M.,	" "	1-3000.
Seventh day, 9 A. M.,	" "	1-2000.
Eighth day, 9 A. M.,	" "	1-2000.
Ninth day, 9 A. M.,	" "	1-1000.
Tenth day, 9 A. M.,	" "	1-1000.

The last irrigation should be followed by an anterior irrigation of a 1-5000 solution. The irrigation treatment is then

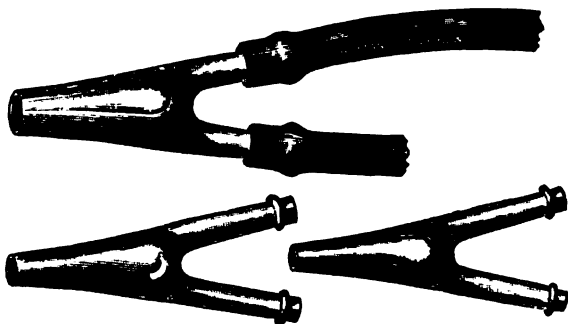


FIG. 60.—Ends to Chetwood's Urethral Irrigator.

discontinued and two days later an examination for gonococci is made. If they are still present another series of urethral irrigations is given, the strength of the solution sometimes being increased to 1-500. Occasionally a solution in the strength of 1-4000 acts better than a stronger preparation, which may excite considerable irritation. This method of local treatment has been modified by Chetwood. His apparatus allows both urethral and vesical irrigation without re-

moving the instrument. In many respects it is the best of the many methods advocated. Its distinctive feature is a glass penile nozzle having a large urethral opening and two arms (Fig. 60), one for the inflow and the other for the outflow current. An alternating scissor-like shut-off (Fig. 61), connected by two rubber tubes is attached to the nozzle, and by alternately closing and opening the cut-off spring the flow of the solution and the distension of the urethra with the selected irrigating solution flowing from the reservoir is regulated.

The deep urethra and bladder may be irrigated by introducing a No. 12 French soft rubber catheter, well lubricated with



FIG. 61.—Chetwood Scissor Cut Off.

Lubrichondrin, slowly into the bladder, a constant stream of the selected Permanganate solution flowing through it as the catheter enters, which flushes out the urethra. On entering the bladder the catheter is uncoupled and the urine evacuated, the catheter withdrawn about an inch, connected to the irrigating tube extending from a suspended fountain syringe and the solution allowed to flow into the membranous and prostatic urethras and back into the bladder. When the bladder

is full the catheter should be removed and its contents evacuated per urethra.

When microscopic examination of the urethral discharge demonstrates the presence of streptococci or other pus-producing germs, a solution composed of equal parts of the selected Permanganate of potash preparation and one of Bichloride of mercury, 1-20,000, will not only be kindly received by the diseased urethra, but the pus-producing germs will generally be quickly eradicated, facilitating the cure. After hydrostatic irrigations of the urethra the entire penis often becomes exceedingly oedematous, but this need cause no alarm as the oedema soon disappears.

Permanganate of potash does not possess, in the solutions advised in the treatment of gonorrhoea, a germicidal action, but it does induce an artificial oedema of the mucous membrane, thus greatly vitiating the nutrient supply of the gonococci and inhibiting their proliferation. This action holds good for about two weeks, but if by that time germ proliferation is not checked, the value of this method of treatment is greatly reduced or becomes practically useless. Some surgeons, with excellent results, follow the Permanganate irrigations with a Protargol, Argonin or Argyrol injection of proper strength.

The two-glass urine test should be made at each visit. If the test urine in the second glass appears mealy, or cloudy, especially if there is accompanying uneasiness in the perineum and pain at the neck of the bladder, it is evident that the posterior urethra is involved, and Protargol, if being used, must be discontinued; if Argyrol, it must be applied directly to the deep urethra, and if urethral injections of Permanganate of potash, the anterior irrigations of the urethra must be followed by irrigations of the deep urethra which should be repeated at proper periods until the posterior urethritis is relieved.

Sometimes, notwithstanding the use of seemingly proper

injections or irritating solutions, the urethral discharge continues. When this occurs it may be due to the solutions being too strong, too irritating, or having been too long continued; if the latter, discontinuance results in immediate cessation of the discharge.

Often an astringent injection to allay the congestion of the submucous tissues will be required to complete the cure, but it must not be used until all pathogenic micro-organisms have been eradicated or they may be driven further back in the canal or into the deeper tissues and deep genitalia where they may be imprisoned and condition further infection notwithstanding the astringent solution may at first be apparently beneficial. The astringents which give very satisfactory results, and which should be used three times daily after urinating and retained for one minute, are :

℞ Zinci permanganatis, gr. ss.-j.
Aquæ destillatæ, ℥iv.

Or,

℞ Zinci sulphatis, gr. iv.-xij.
Hydrastis (Lloyd's), ℥iv.
Aquæ destillatæ, q. s. ad. ℥iv.

Or,

℞ Potasii permanganatis, gr. i-ij.
Aquæ destillatæ, ℥iv.

Or,

℞ Berberini muratis, gr. iiss.
Aquæ destillatæ, ℥iv.

M.

When the discharge is scanty and watery :

℞ Zinci chloridi, gr. j.
Zinci iodidi, gr. iss.
Aquæ destillatæ, ℥ix.

M.

When the muco-purulent discharge is not effected by the antiseptics the following are often beneficial :

- ℞ Ext. Hydrastis (colorless).
 Bismuthi sub-nitratis.
 Glycerini, āā. ℥ij.
 Aquæ destillatæ, ℥iv.

Or,

- ℞ Hydrastis muriatis, gr. x.
 Ext. Hamamelidis, ℥ij.
 Glycerini, ℥ss.
 Aquæ destillatæ, ℥iv.

Or,

- ℞ Hydrastini sulphatis, gr. ij.-viij.
 Borolyptol, ℥iv.
 Aquæ destillatæ, q. s. ad. ℥viij.

Or,

- ℞ Zinci sulphatis, gr. x.
 Bismuthi sub-nitratis, ℥ij.
 Liq. hydrastis (colorless), ℥ss.
 Aquæ destillatæ, q. s. ad. ℥ij.

Or,

- ℞ Zinci sulphatis, gr. xij.
 Plumbi acetatis, gr. xv.
 Liq. hydrastis, ℥ss.
 Aquæ destillatæ, q. s. ad. ℥iv.

If the urethral injections excite pain or much discomfort they must be discontinued or greatly reduced in strength. This is particularly true of injections or irrigations with solutions containing Bichloride of mercury.

At the beginning of the fifth week, when nothing remains but the well-known "morning drop," and the urine is clear but contains shreds, it is well to use the Argyrol solution at night and to use once or twice through the day an injection made from one of the following formulæ:

- ℞ Acidi carbolici, gr. iv.
 Zinci sulphatis.
 Pulv. alumenis, āā. gr. xii.
 Aquæ destillatæ, ℥iv.

Or,

℞ Cupri sulphatis, gr. iv.
 Aquæ destillatæ, ℥iv.

Or,

℞ Zinci chloridi, gr. iv.
 Aquæ destillatæ, ℥iv.

Or,

℞ Zinci iodidi, gr. iv.
 Zinci chloridi, gr. iv to viij.
 Aquæ destillatæ, ℥xvj.

Very strong injections are injurious, their use often inducing chronic inflammation of the bulbous and membranous urethras, evidenced by frequent micturition, supra-pubic and perineal discomfort. When these conditions appear, the injection must be discontinued even though its effects are seemingly beneficial. Astringent urethral injections are always contra-indicated when acute inflammation of the bulbous, membranous or prostatic portions of the urethra are present, medicinal and hygienic measures alone being advisable. During the declining stage, if considerable irritation exists, causing frequent calls to micturate, etc., the local application by instillation of a few drops of a 5 to 20 per cent. solution of Argyrol; Nitrate of silver, 1-2000 to 1-500; Sulphate of copper, 1-250, or Sulphate of thalline, 1-100 to 1-30, to the bulbous, membranous or prostatic urethra is often necessary and curative. If the inflammation has occurred in one of a tubercular diathesis, Bichloride of mercury, 1-3000 to 1-4000, often acts very satisfactorily. In the second or third week of a gonorrhœal urethritis, if the clinical symptoms and the two-glass test indicate involvement of the whole urethra, the treatment by hand injections should be temporarily abandoned. Deep urethral instillations of a 10 per cent. solution of Argyrol are then employed at short intervals until such time as the tested urine become clear. Such application

should not be made at less than three-day intervals, and if unpleasant reaction follows, the application must not be repeated.

When deep urethral instillations are necessary they may be given with the Keyes-Ulsmann urethral syringe. This syringe holds about one drachm, and is connected to a sound-shaped terminal about fourteen millimeters in circumference with a pin-sized bore, the solution being ejected from its terminal point. The Bangs' syringe sound, which is constructed upon a similar principle, excites less pain. When a metal instrument cannot be easily procured a Taylor syringe, which has a glass cylinder and rubber fittings, the nozzle being drawn to a fine point to fit into a No. 8 soft rubber catheter, will prove all-sufficient. The catheter should be cut eight inches long so that when it is fully introduced into the urethra its eye will be located approximately in the prostatic urethra. The catheter should be sterile, lubricated with Lubraseptic, and while it is being slowly introduced, through it a few ounces of a warm aqueous Boric acid solution may be injected to wash the canal of all infected material and prevent its being carried deeper. When in proper place the selected solution can be instilled without discomfort to the patient.

Acute gonorrhœal urethritis sometimes cannot be cured by any method of treatment until after the eradication of local lesions which were present previous to the gonorrhœal invasion. When the discharge is due to an exacerbation of some diseased condition of the urethral walls, ejaculatory ducts, prostate or seminal vesicles, injections and irrigations are often disappointing, for while they may control it during their administration, it returns on their discontinuance and will require treatment for the local conditions as outlined under chronic urethral lesions.

General Treatment.—During the first stage of a urethritis, that is during the first three to seven days, Aconite, Gelsemium

or Pulsatilla are generally indicated. In the second stage, which corresponds to the succeeding two weeks, Cannabis sativa, Capsicum, Pulsatilla, Sulphur, Mercurius corr., Cubebs, Creosote, Argentum nitricum, Ichthyol, Sandalwood oil, ten drops in capsules after meals, or Methylene blue, etc., may be useful adjuvants. Copaiva acts best during this stage in material doses, the following being especially valuable :

R Solid Balsam copaiva.

Heavy Magnesia, aa. grs. ij.

Salol, gr. j.

M. Ft. tablet.

Sig.—From one to three tablets to be taken before each meal and at bedtime.

Copaiva and Sandalwood, when eliminated with the urine, have a blenorrhagic effect; they diminish the discharge, ameliorate the discomfort experienced during urination and render the urine somewhat aseptic, but the effect upon the gonococci is slight. Copaiva in full doses may, however, disarrange the stomach and excite nausea or produce a Copaiva erythema of the skin, and Sandalwood by causing congestion of the kidneys induces pain in the back.

When the deep urethra is involved, and frequent painful urination and tenesmus are present, relief may be obtained from Piper meth., Picric acid., Thyme, Petroselinum, Buchu, Gelsemium, Mercurius corr., Cantharides, etc. Small doses of Opium by the mouth or rectal suppositories containing one-quarter grain of Morphine and one-eighth grain of Belladonna, every three to four hours, often greatly relieves; Hyoscyamus, in three to five drop doses, is often effective. The preparation which has given the author the best service, and for which he is indebted to the late Dr. E. M. Hale, is :

R Balsami copaivæ.

Olei santali, aa. ℥ss.

Olei cinnamoni, ℥j.

Emulsi acaciæ, ℥iiiss.

Elix simplicis, ad. q. s. ℥vj.

Sig.—Two teaspoonfuls every four hours until relieved, then a teaspoonful three or four times a day as required.

A capsule containing ten drops each of Sandalwood oil and Balsam copaiva and one minim of oil of Peppermint taken before meals acts even better.

Hot sitz baths and rectal irrigations, using three quarts of a 3 per cent. saline solution, or filtered Chamomile tea at a temperature of 115° to 120° Fahr., are often helpful.

The tendency to chordee may be overcome by Camphor, five drops of the tincture in water every four hours, or seven drops of Thuja at bedtime, Bromide of Camphor, Lupulin, thirty to sixty grains at bedtime, or Clematis, Thuja, Gelsemium, Lupin, Aconite, Belladonna, etc., as symptomatically indicated. *Salix nigr.*, in sixty drop doses of the tincture at bedtime, has been effective.

Traditional medicine recommends large doses of Bromide of potassium alone or in combination with Monobromate of camphor or Antipyrine:

℞ Monobromate of camphor, grs. xv.

Bromide of potash, grs. xlv.

Sig.—To be taken in one or two divided doses at bedtime.

Holding the penis in iced water, placing it in contact with cold steel, ice, etc., the application of Vaseline to the glans penis on retiring, or washing it with cold water for five minutes at a time, four to six times a day, also afford relief.

Aconite is indicated at the commencement of urethral inflammation. Crawling, stinging pains in the meatus and glans penis; stitching, aching pains in the fossa navicularis; urine hot and burning, possibly burning at the neck of the bladder when not urinating; muco-purulent as well as copious, greenish discharge; chordee; malaise, fever, thirst, etc.

On the second to fourth day *Cannabis sativa* or *Argentum nitricum*, in the severe forms, and *Pulsatilla*, in the mild cases, will generally be indicated.

Argentum nitricum.—Discharge purulent; urethra feels

sore and swollen and painful. The general symptoms are similar to those of *Cannabis sativa*, though there is more of a sensation of constriction through the body of the penis; micturition is more difficult and painful, with a sensation as though a drop of hot lead was passing along the urethra after urinating; dragging, stabbing pains along the urethra are of frequent occurrence; shooting pains in the urethra extending to the anus, spermatic cords and testes; discharge of purulent matter and blood; chordee.

Camphor acts kindly in posterior urethritis when strangury is a prominent symptom; it is also useful in relieving the chordee.

Cannabis sativa.—Meatus inflamed, painful to the touch; penis feels sore and sensitive; glans dark red; prepuce swollen and inflamed; sensation of a pressure in the forepart of the urethra, as if about to urinate; during micturition, burning, smarting and tingling in the urethra; urine burns and scalds when voided; sometimes bloody; frequent urging to urinate, even when the bladder contains no urine; discharge may be moderate, or copious, white or yellow, with bladder irritability; it may be thin, watery, greenish and offensive.

Cantharis.—Purulent, yellow discharge from the urethra with burning, smarting and tingling in the urethra; urethral irritation intense, particularly tenesmus. Sexual erethism and chordee; painful erections preventing sleep. Desire to urinate may return every two or three minutes; the urine dribbles away in drops with burning and cutting pains; burning and urging continues after urination; exacerbations of the tenesmus return every two or three minutes; sensation as though molten lead were being voided through the urethra; vesical tenesmus almost unbearable. *Cantharis* is particularly serviceable when the posterior urethra is involved or a gonorrhœal discharge has been suppressed by injections.

Capsicum.—Urethral discharge thick and yellow in character with fine stinging pains in the meatus urinarius ; stitches in the urethra between the acts. It is especially useful in fat people of lax fibre and rather indolent disposition. It also has violent tenesmus and strangury.

Copaiva acts well during the second and third week, and is indicated for the swelling and inflammation of the urethra with pulsating pains through the glans, with constant, ineffectual efforts to urinate ; urine voided drop by drop, with burning and smarting in urethra and neck of bladder (posterior urethritis) ; urination painful, with a milky discharge or profuse purulent flow, corrosive in character, with a tumid, gaping, inflamed meatus.

Digitalis.—Thick, purulent, bright-yellow discharge from the urethra, with strangury, frequent urging to urinate at night. Glans penis inflamed, covered with pus ; prepuce oedematous, dark, purplish in color and infiltrated with serum. Violent erections, chordee ; involuntary seminal emissions during sleep without dreams and often followed by great weakness.

Gelsemium.—Useful in the urethral discharge before it becomes purulent, with burning at the meatus and along the line of the urethra, accompanied with pronounced urethral soreness. It acts well when the discharge has been suppressed, and in the complicating rheumatism of gonorrhœa.

Mercurius corrosivus.—Urethral discharge green, purulent, worse at night. Glans penis appears deep red or even gangrenous ; meatus urinarius very red and swollen ; burning and swelling of the urethra ; much burning in the urethra between the acts of micturition and violent tenesmus during the act.

Mercurius solubilis Hahnemanii.—Urethral discharge greenish and purulent ; meatus very red, accompanied with some phimosis ; discharge is worse at night ; much burning in the

urethra between the acts of micturition. This remedy is particularly useful in the later stages of acute urethritis.

Pulsatilla.—Urethral discharge thick, muco-purulent; yellowish or greenish-yellow. Urging to urinate with some pain in the urethra; urethral inflammation not intense. Pain in the groin or extending across the hypogastric region from side to side. It is particularly useful in subacute cases of gonorrhœa and especially for the accompanying epididymitis, prostatitis and gonorrhœal rheumatism.

Sulphur.—Urethral discharge thick and purulent, or thin and watery, with burning and smarting during urination; bright redness of the lips of the meatus urinarius; phimosis with inflammatory inflammation and induration of the prepuce.

Sandalwood is often efficacious, especially when the posterior urethra is involved, with burning, stinging and smarting in the urethra while voiding the urine; discharge thick, yellow or muco-purulent.

Thuja.—Discharge thin, greenish, with scalding pain during urination, followed by a sensation as though a drop of urine remained and would be discharged. Constant desire to urinate, though only a few drops of bloody urine are voided at a time; if not voided, intense itching in the urethra is excited. Painful erections at night; erections do not prevent urination. It is particularly useful in recurrent gonorrhœa or when the discharge has been checked by injections, cold, etc.; also in the associated epididymitis, prostatitis or rheumatism.

Ustilago often relieves the fixed pains in the fossa navicularis.

Tubercular Urethritis.—This form of urethral inflammation is uncommon. It may develop in the glans penis and extend backward along the canal, or in the seminal vesicles or prostate and travel forward. The tubercular bacilli from a

remote tubercular focus or the general circulation may be eliminated by the kidneys, and while flowing along the urethral canal with the urinary stream become deposited upon and infect an abrasion or other lesion of the urethral mucous membrane, and be the origin of a tubercular urethritis.

Pathological Anatomy.—The mucous membrane becomes congested, thickened, and may ulcerate. Small abscesses may develop in the submucous tissues, coalesce, break through and destroy the epithelia of the urethra, giving rise to a profuse purulent discharge, or open into the seminal vesicles, prostate, bladder, rectum, etc., and produce a local tubercular inflammation of these structures. In the anterior urethra the corpus spongiosum may become infiltrated and thickened and give to the examining finger the sensation of a tube with hard unyielding walls.

Clinical History.—When the tubercular urethritis is subacute in nature there may be but few symptomatic manifestations; the meatus is generally slightly occluded in the morning. Possibly later in the course of the disease, when the system becomes undermined and if alcoholics are used to excess, a continuous urethral discharge may be present. When the anterior urethra only is involved there is often a muco-purulent discharge from the urethra, which is accompanied with some burning. The urine remains clear, but contains shreds and pus, epithelial cells, mucus and albumin. The calls to micturate increase in frequency, particularly after exercise, exposure to cold and indulgence in stimulating drinks.

When the lesion is located in the deep urethra and is acute in character it excites a varying amount of purulent urethral discharge, pronounced vesical tenesmus and even incontinence, micturition being followed by the discharge of blood; the urine voided is purulent and albuminous. This variety of urethritis is generally conditioned by the engrafting of a gonorrhœal infection upon the urethra of a tubercular

subject, though it may arise in the tubercular from instrumentation and injudicious urethral injections or irrigations.

Treatment.—Individualization is always necessary. The general hygienic care advised in other forms of urethritis is usually indicated. Malt liquors and whiskey are often beneficial. Cod liver oil in some form or Russell's emulsion of fats is always indicated. Liquid nourishment must be ingested to the limit of tolerance and the general condition of the patient should be built up. Creosote, in increasing doses, one to ten minims in capsule after meals, until tolerance has been reached and Kolaghla, two grains in pill form, three times a day, have their reported cures. Whenever tubercular urethritis exists, even when associated with gonorrhoeal complications, it is, as a rule, best to depend for its relief upon hygienic and medicinal methods, as most urethral irrigations or injections increase the inflammation, Silver nitrate being especially harmful.

When the deep urethra is involved and the tenesmus is particularly distressing, deep urethral instillations of Bichloride of mercury, 1-2000, every three to seven days, through a Bangs' syringe sound are often beneficial. If hæmorrhage or tenesmus are present, the application of fifteen drops of a solution of Cuprum sulphate, two to ten grains to the ounce of water, sometimes acts very satisfactorily. The indicated remedy should always be prescribed.

Syphilitic Urethritis.—Lues may attack the urethra in the primary, constitutional and tertiary stages. The initial lesion may be located just within the meatus or at the posterior part of the fossa navicularis. In either location, unless irritated by instrumentation or applications, it causes little disturbance or discharge. Its presence is often overlooked. When the chancre is located at the meatus the induration may extend backward along the canal a considerable distance; when it is located in the fossa navicularis there is marked induration of

that portion of the canal which can be readily demonstrated by external manipulation. The condition rarely causes noticeable urinary obstruction and only a slight mucous discharge.

During the constitutional period of syphilis, particularly when the urethral mucous membrane is damaged, a specific erythema or mucous patches may develop in the urethra and be accompanied by a slight mucous or muco-purulent discharge.

Gummatous involvement of the urethra sometimes occurs in late syphilis, generally commencing at the meatus. It may extend backward and involve the corpus spongiosum and even the entire penis. There is generally an accompanying profuse purulent discharge, but other special symptoms are often absent.

Treatment.—This must be along the line of constitutional medication, as local treatment is generally irritating, retards recovery and causes complications.

Chancroidal Urethritis.—Lesions of this character rarely extend beyond the fossa navicularis. The ulceration is generally quite painful and accompanied by profuse purulent discharge.

Treatment.—The condition is troublesome, rebellious to treatment, and sometimes discouraging. After each micturition, the parts must be douched successively with Hydrogen peroxide, one part to three of water, and an aqueous solution of Bichloride of mercury, 1–20,000, and the lesions dusted with Calomel or Dermogen. Mercurius solubilis Hahnemannii 3x should be given internally; its effects being generally marvelous.

Chronic Urethritis.—A chronic urethral lesion following an acute specific or non-specific inflammation may be located either in the anterior or posterior urethra or in both. It usually evidences itself by a urethral discharge, etc. A chronic urethral discharge, however, is not in itself diagnostic

of a chronic urethral lesion, as it may be due to a Cowperitis, prostatitis, spermato-cystitis or inflammation of the ejaculatory ducts. It is sometimes occasioned by sexual excess or mental masturbation. Some individuals, through special idiosyncrasies, possess a chronic urethral discharge which has no discoverable source. Chronic urethritis is often associated with or is the result of some other disease, *e. g.*, hypertrophy, tuberculosis, or cancer of the prostate. It may be due to traumatism of sounds, etc. A chronic urethral lesion may also exist without accompanying urethral discharge.

When an individual who has apparently been cured of acute urethritis, and has enjoyed an interval of seemingly good health, indulges in alcoholic or sexual excess, and notices soon after a watery, muco-purulent urethral discharge which rapidly subsides under properly directed treatment, but again recurs on repeating the indulgence, it is evident that a chronic urethral lesion exists. This condition depends generally for a predisposing cause upon a strictured or granulated condition of the urethra or some constitutional dyscrasia. The exacerbation is known as a recurrent urethritis or a relapsing gonorrhœa, and is often wrongfully attributed by both physician and patient to an unhealthy second party, who in reality is free from specific disease.

Micro-organisms are always present in the urethral discharge of chronic urethritis; bacteria and micro-organisms of little importance can generally be demonstrated (recurrent urethritis). The presence of gonococci (relapsing gonorrhœa) are important as regards prognosis and treatment, but their non-discovery does not conclusively demonstrate their absence, or that they will not appear in large numbers after a relapse due to the enlivening of a previously dormant deep-seated nidus of infection.

Pathological Anatomy.—Oberlander describes two general conditions in chronic urethritis, *i. e.*, a soft infiltration which

permanently remains in the embryonic state without the formation of connective tissue fibre, and one where the infiltrated new tissue is soon transformed into connective tissue with consequent thickening and narrowing of the invaded urethral wall, the hard infiltration. When soft infiltration occurs the urethral surface appears inflamed and **turgescent**, the epithelium swollen and often slightly **desquamated**, the infiltration being usually more pronounced and **dense** about the peri-urethral glands. As the disease becomes chronic the epithelium is gradually transformed into the **pavement** variety. In the hard infiltration, the urethral ducts are compressed by the infiltrated tissue surrounding them, often the products of secretion accumulate in their deeper portions and transform them into small cysts; the ducts, may, however, remain permeable. The inflammatory infiltration is accompanied by an endo-peri-arteritis of the larger vessels, resulting in some obstruction of the circulation. The spongy spaces in the corpus spongiosum are also obliterated by contraction of the cicatrix; the corpora cavernosa are frequently involved. During the period of soft infiltration, the mucous membrane appears hyperæmic, varying from a deep-rose to a bright-red or purple. In the hard infiltration, the fibrous tissue strangulates the vessels, impedes the circulation and gives to the interior of the urethra a yellowish-gray or dead flesh color. In chronic urethritis, irregular areas, chiefly in the central or anterior portion of the pendulous urethra, are invaded by a catarrhal inflammation. The epithelium of the normal urethra is smooth, moist, transparent and uniformly brilliant. As it becomes diseased by inflammation it loses its polish, becomes opaque, grows dull, at first it continues to be smooth, but later, in the more chronic conditions, the epithelium often desquamates exposing the papillary layer, which by proliferation springs forth as small reddish granulations or excoriations. In the soft infiltration those areas of the urethral mu-

cous membrane are slightly elevated above the healthy surface. After the hard infiltration has taken place the zones are often surrounded by reddened rings of soft infiltration. In the centre of the diseased area, small granulations of a red, reddish, or yellowish-gray color, as though larded, and of irregular form occur, which tear and bleed easily, and small cicatrices are occasionally noticed.

On endoscopic examination these areas appear as small, quite superficial granulations, though they may be several millimeters high. Eschars due to urethral injections are sometimes discovered. The salts of zinc produce white-colored eschars, particularly pronounced at the summit of the folds of the mucous membrane, which may persist after a treatment for one or two weeks. Resorcin produces irregular, large, grayish-white, shrivelled scars. Nitrate of silver produces a uniformly white scar, the mucous membrane appearing as if covered with a layer of dust. When Nitrate of silver has been used locally for several months it induces the condition known as argyrosis, the mucous membrane presenting a slightly bluish or blackish plaque resembling an ink spot. When located at the orifices of the urethral glands or lacunæ small black circles appear, which may persist for years without inconvenience.

In the healthy urethra the longitudinal folds of the urethral mucous membrane, upon endoscopic examination, appear as radiating lines from the central figure, the lines being more pronounced at the centre and become less distinct at the circumference of the urethroscopic field. In catarrhal inflammation, when the mucous membrane is uniformly thickened, the folds become larger, thicker and less numerous than normal, often being reduced to two or three in number. When the urethral wall is invaded with a hard infiltration these folds are diminished in number, and then, when the condition is pronounced, they entirely disappear, though, if the infiltration

is very dense, the surface of the mucous membrane, even in the centre of the plaques, may present certain elevations somewhat resembling the striation of the normal mucous membrane. The glands of Littre, which in health are invisible, become distinguishable, appearing as four to forty small lenticular plaques upon the surface of the urethral mucous membrane. They are visible, because of the destruction of the superficial epithelial tissues covering them; if their excretory ducts alone are involved they may be scarcely perceptible, appearing as small impressions or indentations upon the surface the mucous membrane covering them being pale-red and slightly puffed out. Littre's glands are often infiltrated, the hypertrophy appearing as a varying number of different sized swollen points upon the surface; sometimes a slight bloody effusion forms a small blackish circle about them. When these glands are situated quite superficially and their ducts become obstructed they may appear on the surface as small transparent vesicles which sometimes reach the size of a hemp seed. When these glands are involved there is always an associated tenacious and persistent suppuration and chronic urethral discharge which is particularly rebellious to treatment. The lacunæ Morgagni, when obstructed, appear as tumefactions of a red or deep-red color, on the summit or sides of which a muco-purulent material is deposited in which infectious germs may often be discovered. At times the orifices of the lacunæ remain wide open, or if they contract, cysts appear as small red tumors standing out beyond the surface of the mucous membrane.

On endoscopic examination of the anterior urethra the stage of soft infiltration is characterized by the natural longitudinal folds becoming less numerous, the entire endoscopic field possibly being filled by one large prominent lacuna, or the mucous membrane may appear smooth, red, swollen and destitute of folds. In the soft infiltration of chronic urethritis

the mucous membrane is never dry or rigid, the central figure collapsing immediately on withdrawing the endoscope. Littre's glands are slightly, if at all, involved, the lacunæ Morgagni appearing as deep red nodules, varying in size from a pin head to a small pea, upon the summit or the side of which the swollen, translucent and glassy orifices open, after discharging a purulent secretion. In the more chronic stage, or hard infiltration, the longitudinal folds are largely, if not completely obliterated. As the endoscope is withdrawn, the canal, on account of the rigidity of its walls, remains widely gaping. The epithelial lining is dull in spots or desquamated, and at times presents opaque grayish plaques. Littre's glands appear as small pin-head swellings, when slightly diseased, their orifices, being prominent and appearing like small pin-pricks in the fibrous plaques, from which oozes a mucopurulent discharge. Cicatrices are often visible. In the dry form, the diseased area is of a uniformly pale yellow-gray color, the epithelium is markedly desquamated and bleeds profusely, the glands of Littre and the lacunæ are enlarged and prominent. When the mucous membrane of the posterior urethra is the site of soft infiltration it becomes dull red or purple in color and loses its lustre. When hard infiltration occurs the membrane becomes dry, loses its lustre and assumes a dull grayish-red or slightly yellow color and may be deformed by cicatrices. In soft infiltration the epithelium is somewhat swollen; in the hard variety it desquamates readily, the mucous membrane being frequently denuded over a considerable area. This surface may present a fine granular epithelial or papillary fold which may even become papillomatous. The folds of the mucous membrane in the membranous region become larger and less numerous when attacked by soft infiltration and finally disappear; the glands of Littre, though few in number, increase in size; the veru montanum swollen, dull red and purple in color, loses its lustre and is transformed, as it were, into one or two deep folds.

A papillomatous urethritis may arise from excessive proliferation of the mucosa where the papillary layer is exposed by the desquamation of the epithelium. The larger areas occur particularly in the bulbar and prostatic regions, they may extend throughout the entire length of the urethra, developing generally upon a point of hard infiltration.

The walls of the urethral canal in chronic urethritis of the membranous portion becomes rigid from subepithelial infiltration, and, when subjected to the powerful action of the sphincter muscle, split open and deep fissures and cracks with red, easily bleeding bases form, which on healing leave cicatrices. In the prostatic urethra this condition often accompanies follicular abscesses which also leave cicatrices. Infiltration of the veru montanum sometimes terminates in a dense fibrinous deposit, which, on contracting, may close the ejaculatory ducts, or, if the inflammation extends into these ducts, they may lose their elasticity, become rigid, open and pouchy. An accompanying involvement of the glandular tissue of the prostate is not uncommon.

Clinical History.—Chronic anterior urethritis may exist alone, though there is generally an associated involvement of the posterior urethra. Chronic urethritis gives rise to a varying amount of urethral discharge. The meatus in the morning may be glued together, there may be a continual moisture or dampness at the meatus; the "goutte millitaire" may appear on arising or only on stroking the urethra from behind forward. The discharge is sometimes copious and continuous, though it is subject to great variation, depending upon diet, exercise, lack of general or local hygiene, etc. When the chronic urethritis is limited to the posterior urethra the associated urethral discharge is usually intermittent, rarely continuous. It may appear to be absent during the day, being washed out by the comparatively frequent urination, consequently the urine voided will contain a varying amount of

these products of urethral inflammation. The quantity and variety of these shreds are particularly significant, and, if carefully observed, will be of material assistance in the prognosis and treatment of the disease.

The urine, if possible, should, for diagnostic purposes, be evacuated in three glasses, as follows: Two ounces should be voided in the first and about the same quantity in the second glass, when a digital rectal examination of the deep parts—the membranous urethra, the prostate, seminal vesicles—should be made, abnormalities noted and the parts slightly compressed to evacuate their contents, if possible, into the deep urethra; the remaining urine, if voided into a third glass, will contain the material from the prostate, Cowper's glands, seminal vesicles, etc. If the first specimen contains free pus and shreds (Trippfaden) and the other two are clear, a lesion in the anterior or posterior urethra will be suggested; if most of the shreds are in the first specimen and only a few in the second, the lesion probably involves the deep urethra; if the products of inflammation are only present in the first and third specimens, the lesion is in the seminal vesicles, prostate or ejaculatory ducts with a probable slight involvement of the deep urethra; if they exist only in the third glass the discharge is undoubtedly from the seminal vesicles; if the three specimens are purulent, the lesion may be located in the deep urethra, prostate, seminal vesicles, bladder or kidneys.

A differential diagnosis of the urethral location can be established by distending the forepart of the urethra with about two drachms of an aqueous solution of Permanganate of zinc, 1-500, and retaining the same in the canal for about twenty seconds; the shreds in the urine voided one-half hour later, if from the anterior urethra, will be stained brown and can be easily differentiated from those originating elsewhere.

A cloudy urine does not always signify a purulent urine.

The cloud must, by chemical or microscopical examination, be differentiated from that due to phosphates, which clears up on adding a few drops of Acetic acid, to amorphous urates, which dissolve on applying heat, or to bacteria.

The origin of the shreds floating in the urine is generally evident from their contour. White, fine, slender shreds of varying lengths are from the anterior urethra; they are composed of a dense aggregation of pus cells and settle quickly to the bottom of the receptacle containing the urine. Small granular flakes which settle slowly usually originate in the anterior urethra; they are composed of pavement epithelium with a few pus cells intermingled. The tadpole shreds, having globular heads, settle at once and usually come from the deeper parts of the urethra, originating in a small granular spot or ulcerated follicle, which yields the pus heads, the remaining portion or tail being obtained from mucus in the urethra. Clumpy masses or broken pieces of irregular size, composed of epithelium and pus cells and the comma tacks, are from the deep urethra, the mucus coming largely from the prostate. Shreds an inch or more in length, tapering at both ends, emanate from the ejaculatory ducts, while glairy areas of opacity, which tend to float, especially if they contain symplexions and spermatozoa, proceed from the seminal vesicles.

When the anterior urethra alone is involved, increased frequency of micturition is rare, though there may be considerable burning and uneasiness as the urine passes over this region. When the lesion is located in the deep urethra, generally there is increased frequency in the calls to micturate, with inability to retain the usual quantity of urine, sometimes with accompanying incontinence and tenesmus, or a pain which may extend down the penis and be referred to the glans penis or the supra-pubic or the perineal region. When the tenesmus is severe the last few drops of urine may appear

bloody, and subsequent urination may be preceded by the discharge of a small clot of blood. The urinary symptoms may be ever present or subject to remissions and exacerbations. Dribbling of urine after micturition is not infrequent. The urinary stream may be smaller than normal, twisted or in drops, a condition which may be ascribed to some organic narrowing of the canal, though not infrequently, particularly where at times the act seems normal in all respects, it is due to congestion and spasm at some point in the urethra.

Chronic posterior urethritis symptomatically resembles chronic cystitis though it induces more reflex symptoms.

All subjective conditions are more pronounced when the posterior urethra is involved, though through the sympathetic nervous system, lesions involving the anterior urethra may induce all the symptomatic manifestations expected from involvement of the posterior portion of the canal.

Sexual desire is often greatly modified. Sexual erethism is sometimes intensified, erections may be painful and the ejaculation is at times accompanied by a stinging sensation referred to the deep genitalia. In the majority the sexual desire and power are decreased, ejaculation occurs too early, with an irritable weakness (*reizbare Schwäche*), or the ejaculation may be retarded or impossible.

The sexual sphere is often greatly affected by the condition of the general system, all untoward manifestations disappearing when the general condition is good, and appearing after, or being aggravated by, excesses and fatigue.

An attempt to locate the lesions, indurations, etc., resulting from a peri-urethritis, stricture, etc., should be made by passing the tip of the finger along the under surface of the penis. For diagnostic purposes, as well as for prognosis and treatment, a local examination of the urethra, under strict aseptic methods, must be conducted.

Previous to instrumental examination of the urethra the

glans penis and prepuce should always be cleansed with a warm saturated aqueous solution of Boric acid. To lessen the pain of instrumentation, two drachms of sterile water containing 2 per cent. Cocaine and 1 per cent. Carbolic acid may be injected into and retained in the urethra for one minute; this solution bleaches in some degree the mucous membrane, a fact which must be considered in the endoscopic examination. When the local anæsthesia is sufficient the canal can be examined by the urethroscope, bulbous bougie, sounds, etc. The dangers of urethral fever from instrumentation following the first examination should always be regarded. The urethroscopic examination should be made first because the sounds, bougies, etc., may injure the mucous membrane and thus tend to mislead. The urethroscope consists of an endoscope, obturator and light apparatus. The straight endoscope should be used in examining the anterior urethra. The posterior portion can, if advisable, be examined through the straight endoscope, but better results are obtained with an instrument specially devised for the purpose. Urethroscopic examination gives the only accurate information obtainable of the condition of the surface of the urethra, the results of other examinations being relative. The endoscope is a thick-walled silver tube, made in a set of three, 27, 29 and 31 French, fitted with a conical-pointed obturator which facilitates the introduction of the instrument and prevents injury to the urethral mucous membrane. When the endoscope is fully introduced, the obturator, which should have at one side a slight curved groove, or be perforated by a small canal to allow the air to pass in and prevent suction and consequent urethral pain is withdrawn, and the lamp for illumination adjusted. The endoscope must never be pushed backward into the canal unless the obturator is in place, as its sharp unprotected edges may injure the walls of the urethra. Urethroscopes differ principally in the method of illumination, which may be either

direct or transmitted by means of an ordinary head mirror, electric head light, or by a condenser in which is placed a small electric light bulb connected directly with the tube (Otis urethroscope). The Oberlander-Nitze urethroscope is fitted with a small electric lamp at the end of a carrier which is passed into and fixed in the tube after the endoscopic tube has been introduced into the urethra. The original instru-



FIG. 62.—Chetwood Urethroscope.

ment was fitted with a cooling apparatus. The lamp has recently been modified so that the cooling apparatus is unnecessary. The current for the lamp is furnished by three dry cells (Chetwood urethroscope (Fig. 62). The simple endoscopic tubes, of which there are several, may be used with transmitted light (Klots endoscopic tubes).

The æro-urethroscope of Antel deserves mention as a curiosity. In using it the portion of the canal in proximity with the distal end of the tube is over-distended with air, transmitted light illuminates the posterior portion of the canal and the image is thrown upon a small magnifying mirror at the proximal end. In urethroscopes using direct illumination a magnifying glass may be attached to the distal end of the tube and so constructed that it can be turned to any position or angle required. This mechanism is rarely required.

The selected endoscopic tube, having been lubricated with Lubrichondrin, is gently introduced into the urethra to its full extent, the obturator withdrawn, and the illumination properly made. All parts of the mucous membrane should be examined, while the tube is being slowly withdrawn, for erosions, granulations, ulcerations, inflammatory infiltration, distended follicles from which pus may be oozing, congested foci, cicatrices, false membrane, calculi, etc.

Urethroscopic examination of the posterior urethra must not be made when it is acutely inflamed. It is also practically interdicted in tubercular conditions and prostatic hypertrophy. It is unnecessary to say that an intimate knowledge of the normal urethra under illumination is essential before departures from the normal can be recognized. The endoscope is also very useful in making applications along the urethra.

After the urethroscopic examination is complete the presence or absence of abnormal narrowings or obstructions in the canal must be determined by the blunt sound, the flexible or metallic bulbous bougie or the Otis urethrometer. The normal inequalities of the canal must always be kept in mind, and unless they are a seeming element in maintaining a morbid lesion, or they become exaggerated by inflammatory conditions, they cannot be considered abnormal. Congenital strictures of large calibre in a urethra virgin to disease are

usually harmless and unimportant unless they narrow the canal sufficiently to induce urinary obstruction or prevent drainage perpetuating a urethral inflammation or produce sexual derangements.

A congenital coarcted meatus is often the cause of a continued urethral inflammation due to its inciting a continued pounding of the canal by the urine during each act of micturition. A meatotomy may in itself relieve the secondary cause and end a chronic urethral discharge. The same is true of strictures situated at deeper points along the urethra. The technique of examination for narrowing of the urethra and its surgical relief is given under urethral strictures. In chronic urethritis the urethral sound is often necessary both for diagnosis and treatment.

In the normal urethra a blunt, metal, Thompson curved sound, 28 to 30 French, will engage itself and pass along the canal by practically its own weight, inducing only a slight tingling or burning sensation until it reaches the membranous urethra, at which point the contraction of the compressor urethræ may cause a momentary halt, when steady (not forced) pressure will induce relaxation and the instrument will pass into the bladder. Spasmodic contraction at this and other points in the urethra may be due to nervous apprehension or a reflex from some inflammation of the prostate, seminal vesicles or bladder. When the steel sound has been fully introduced the spasmodic stricture relaxes and the instrument rests loosely in the canal; an organic stricture will continue to grasp it tightly. The pouchy condition of the bulbous urethra in elderly men and its liability to obstruct the entrance of the sound unless its tip be kept at the roof of the canal must always be borne in mind. If the sound meets an organic obstruction, it must be withdrawn and a smaller one introduced. Granulations, polypi, foreign bodies, calculi, etc., may retard the introduction of the sound; as a rule, however,

they only give a sense of obstruction. When blood, even in the minutest quantity, appears after a proper instrumentation, even though no lesion has been discovered with the urethroscope or by the touch, some urethral lesion exists and it must be located. If the blood comes from a granulating surface or the rupture of a varicose vein, the prognosis is favorable. When an obstruction has been located its extent can be determined by a bulbous bougie (Fig. 63), or with the Otis

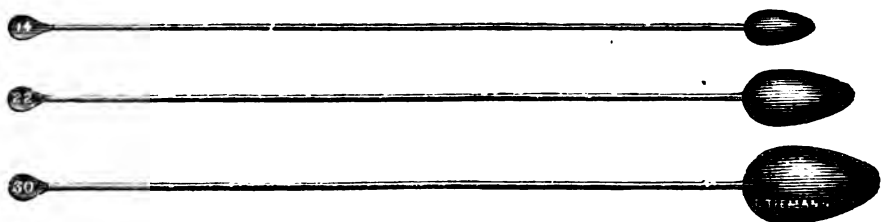


FIG. 63.—Otis Metallic Bougies à Boule.

urethrometer (Fig. 64), the latter by its mechanism demonstrating all strictured conditions in the anterior urethra, even when the meatus is greatly coarcted.

Clinically, and particularly for instituting judicious local treatment, chronic urethritis must be classified into certain

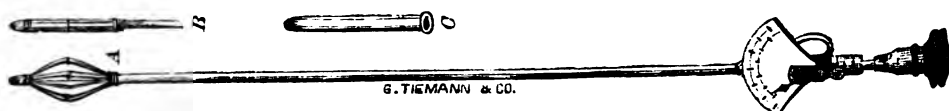


FIG. 64.—Otis Urethrometer.

varieties depending upon the cause, preceding hygiene and treatment, and the individual idiosyncrasy. The local methods of relief, which are advantageous in a simple chronic urethritis, may cause unpleasant complications when gonococci are present, the two varieties requiring distinct methods of procedure.

Chronic gonorrhœal urethritis is not infrequent. The gon-

ococci from some previous infection having lodged in the glands or ducts connected with the deeper portion of the urethra (where they are with difficulty eradicated) become by their presence a constant menace, and under the slightest provocation or exciting cause are likely to induce an exacerbation of the urethral difficulty. This is recognized as a relapsing gonorrhœa, which, if too vigorously treated by local methods, may be followed by complications. It is important, therefore, in order to avoid these complications, *e. g.*, acute urethritis, prostatitis and epididymitis, etc., that, before local instrumental examination or abortive local treatment is commenced this variety of chronic urethritis, by the bacteriological method of investigation already recommended, be proven to be present or absent.

Chronic catarrhal (non-gonorrhœal) urethritis is often occasioned by unnatural sexual habits, particularly masturbation (physical or mental) and conjugal onanism. It is frequently induced by or is secondary to a congenital or acquired stricture in which the urine at each act of micturition, from the well-known physical law, pounds the mucous membrane of the bulbous and prostatic urethras behind the stricture, and produces hyperæmia, etc. It may be the sequella of an incomplete cure of a simple urethritis or a gonorrhœal invasion in which the gonococci have been eradicated but the associated catarrhal condition has not been removed.

Urethrorrhœa, or urethrorrhœa ex libidine, a condition of slight significance, deserves some little attention, as it is often by the laity believed to be a spermatorrhœa, and to be a great drain upon the system, inducing much unnecessary mental anxiety. The discharge is not purulent, prostatic or seminal in character, being simply an excessive mucous flow from the urethral glands induced by an over-supply of blood to the parts conditioned by ungratified sexual longings, thoughts and imaginations. It is often met with in young men and

sometimes in the elderly with erotic thoughts and physical incapacity; not infrequently it is the result of prolonged sexual excitement without gratification, withdrawal or delayed orgasm. This discharge is mucoid, tenacious and has somewhat of a soapy feel; when it is from the urethral glands it is watery and thin; when from Cowper's gland it is thick and tenacious. Microscopically it consists of epithelial cells, mucous corpuscles, films of striated mucus and granular débris of various kinds. This discharge may appear only on separation of the lips of the meatus; it may cause adhesion of the lips in the morning; it may come away in considerable quantity during physical exercise, straining at stool, at the end of micturition and particularly during sexual excitement.

In the strumous, gouty and debilitated a mucoid oozing from a congested urethra remaining after the cure of a urethritis is not infrequent. It is aggravated by local treatment; often it quickly disappears when excessive urethral treatment is discontinued and good general hygiene, with change of climate are instituted and the indicated remedy administered.

Under judicious treatment all varieties of chronic urethritis improve, but the tendency to relapse, even in the non-gonorrhœal form, is a familiar clinical experience, and a return of the disease even with pronounced acute symptoms without recognized cause within a short period after an apparent cure is not uncommon. Were this not understood by the physician it would often be the source of much chagrin. In chronic gonorrhœal urethritis relapses are usually due to the liberation by some known or unknown means of a nidus of pus or infection from a gland or follicle in the urethra or prostate where it had been lying imprisoned and dormant. The exciting cause is often a local irritation resulting from sexual excess, a general catarrhal condition, indulgence in alcoholics or injudicious local treatment.

The urethra often proves excessively irritable in the alco-

holie, the overworked and nervous, in those with excessive business cares, and in those who indulge in sexual excesses, particularly if there has been a continuous disregard of judgment in the methods of life, or when any instrumentation, no matter how gently conducted and surgically correct, induces pain at the time and is followed by acute inflammation of the deep genitalia or the epididymis. These varieties of chronic urethritis tax the resources of the physician and the patience of the patient. Indiscretions on the part of either is often followed by dire results. The neurotic type must not be forgotten, a urethrophobia often preventing any peace of mind long after a physical cure has been accomplished.

Prognosis.—Under properly applied local treatment, strict attention to personal conduct and habits on the part of the patient, with the administration of the indicated remedy, a cure can usually be promised, but a long and very indefinite period may be required for its accomplishment. Coitus may be permitted after the gonococcus has disappeared or it has become latent and cannot be brought into activity by irrigating the urethra with a 1-1000 Nitrate of silver solution. Owing to the weakened condition of the urethral mucous membrane, a new infection may, however, more readily occur under circumstances which in a healthy urethra would be harmless. Nocturnal pollutions may be expected if strict continence is followed, which, from the consequent local irritation and mental worry, often greatly retard recovery. A simple chronic anterior urethritis (soft infiltration) following a severe acute urethritis, continuing for one or two months, usually recovers quickly under appropriate urethral dilatation and instillations, together with the proper internal medication. Deep urethral irrigations, while apparently beneficial and often followed by immediate results, particularly in soft infiltrations with profuse urethral discharge, are so prone to cause seminal vesiculitis and prostatitis that they are usually

contra-indicated. In chronic urethritis a long period of treatment will be necessary. In a relapsing gonorrhœa, auto-infection is always liable to occur from the opening of a diseased gland of Littre or a lacuna of Morgagni, allowing of the escape of gonococci long held captive. These glands may suppurate, discharge and disappear on healing, but many months of the best treatment with proper attention to hygiene on the part of the patient will be necessary. Whenever the seminal vesicles and prostate are simultaneously involved they should be treated first or unexpected exacerbations may occur.

There is great personal individuality in regard to curability, some cases responding readily to treatment while others try the fortitude and endurance of the patient and the surgeon, relapses without apparent reason being frequent and months or years of conscientious treatment often necessary. Disquietude on the part of the patient, a gonorrhœal origin of the disease, an associated enlargement of the prostate or the existence of a complicating catarrhal prostatitis, vesiculitis or epididymitis, augurs a protracted and troublesome case.

Treatment.—When a simple or gonorrhœal inflammation of the urethra has failed to yield to the treatment considered proper, special methods necessary for the eradication of the local lesion must, after careful consideration, be instituted and followed until all evidences of the diseased condition have disappeared. All the measures advised under the treatment of acute gonorrhœal urethritis should be considered. Habits as to eating, sleeping, exercise, hygiene, etc., must be regulated. Excess or indiscretion of any kind may precipitate an exacerbation and undo the work of months, though wine and beer in moderate quantities with the meals may sometimes be permitted. The patient must not be allowed to become despondent or feel that he is among the incurables. Attention should be given to his general physical condition; he must be made to understand that with perseverance and attention to the instructions of the physician a complete cure is possible.

Local and mechanical measures of treatment are usually necessary, although the administration alone of the indicated remedy has many recorded cures. When the disease is situated in the anterior part of the canal, injections are preferable to



FIG. 65.—Kollmann's Urethral Probe.

douches, being more efficacious as they can be more frequently, if not as carefully applied, and involvement of the deep genitalia is avoided.

In obstinate chronic gonorrhœal urethritis the openings of all the urethral ducts and glands must be interrogated not only by ocular inspection through the endoscope but with



FIG. 66.—Urethral Syringe and Probe.

the Kollmann probe (Fig. 65) or the urethral syringe (Fig. 66) to find possible hiding places of dormant gonococci. Often satisfactory results can only be obtained by local treatment through the endoscope. Sometimes the chronic urethritis is due

to a coarcted meatus which prevents complete urethral drainage and induces a continued urethral discharge which quickly disappears after a proper meatotomy. When the lesion is located in the bulbous urethra local treatment through the endoscope, instillations with the Bang's syringe sound (Fig. 67) or irrigation may be required. If the lesion is located in the deep urethra and consists of a slight or superficial infiltration together with a granular condition of the urethral surface, direct local applications will be necessary. In many the chronicity of the discharge depends upon the continued use of too strong and too irritating injections which will cease if they are discontinued.



FIG. 67.—Bang's Syringe Sound.

The local medicaments most frequently employed in the treatment of chronic urethritis are Nitrate of silver, Thalline sulphate, Cuprum sulphate, Tannate of glycerine, Iodine, Iodoform, Argyrol, Protargol, etc.

Small granulated or inflamed areas when present are benefited by the application of five to twenty drops of an aqueous solution of Nitrate of silver 1-2000 to 1-100, with the Bang's syringe sound or the Keyes-Ultzmann urethral syringe, every third day. Nitrate of silver instillations are contra-indicated whenever there is an associated seminal vesiculitis, inflammatory prostatitis, a tubercular involvement of the deep genitalia or an acute gonorrhœa.

Special instruments which can at times be used to advantage are shown in Figs. 68 and 69.

Large or multiple granulations or special lesions may be locally treated through the endoscope every four to eight days

with applications of a 2 to 10 per cent. aqueous solution of Nitrate of silver carried by a pledget of cotton on an aluminum probe or by a camel's hair brush, a separate brush being used for each patient. It is claimed that less reaction follows the latter mode of direct application. The endoscope with obturator in place is always introduced beyond the points to be treated. The obturator is then withdrawn, the urethral moisture at the end of the tube removed with pledgets of cot-



FIG. 68.—Kollmann's Urethral Injection Canular.

ton on an applicator, the electric light introduced and the various diseased points touched with the selected solution as they reveal themselves on the withdrawal of the endoscopic tube. The existence of tubercular lesions should always be

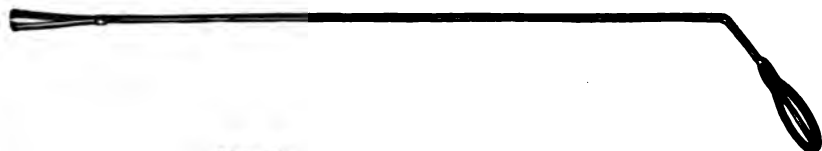


FIG. 69.—Gruenfeld's Porté Caustic.

suspected when the use of a silver solution is followed by prolonged irritation. In these cases Bichloride of mercury is sometimes beneficial.

Sometimes Nitrate of silver is so stimulating, that it causes an unpleasant urethral irritation and a mucous discharge for one or more days. In these cases a non-stimulating instillation of Thalline sulphate in a 2 to 15 per cent. solution

is very beneficial. Sulphate of thalline is astringent, antiseptic and sedative in action. It is indicated particularly in non-gonorrhœal posterior urethritis. When instillations of Thalline are used in increasing strength, they produce a mild sensation of warmth and smarting, followed by comfort, relief of the hyperæsthesia and the lessening of the discharge.

Cuprum sulphate is astringent in action and has an efficient influence upon the posterior urethra. It is useful in non-gonorrhœal posterior urethritis following Sulphate of thalline. It can be used in a strength of 1-500, slowly increasing to 1-50. It burns very little when applied. Tannate of glycerine, diluted one to five times, is sometimes useful as a tonic astringent. When a soothing, mild astringent is required, fluid extract of Hamamelis is often efficacious. Sometimes a mixture composed of Iodine crystals, three to ten grains, to an ounce of Glycerine, acts better than a Silver solution. Iodoform, Aristol, Ichthyol, etc., in 10 per cent. emulsion with Vaseline, can be applied with the author's emulsion syringe, or through the endoscope. Instillations of Ichthyol in 2 to 20 per cent. solutions are helpful in some cases of chronic posterior urethritis. In the gonorrhœal type of chronic urethritis instillations of Argyrol, 2 to 20 per cent., or Protargol, 1 to 3 per cent. (if the lesion is in the anterior urethra), give excellent results; this is particularly due to their germicidal action. They are also efficacious in congestion of the urethra existing behind an old stricture. In the posterior urethra, even the weaker solutions sometimes produce intense dysuria which may continue for a day or two.

When operative relief for the removal of polypi, granulations, opening of peri-urethral abscesses, cysts, etc., or direct treatment of diseased glands and ducts becomes necessary the endoscope is not always sufficient. The bivalve urethral speculum (Tilden-Brown) being frequently required. When

it is necessary to attack these conditions by surgical methods the canal should be douched and anæsthetized, the bivalve speculum introduced and opened to the capacity of the canal; through it linear and annular strictures can be cut with the endoscope knife, polypi removed with the snare or forceps, or they, as well as exuberant granulations, curetted and the bases touched with the electric cautery; pockets irrigated with a solution of Nitrate of silver or Picric acid, 1-1000, or cauterized; abscesses opened with the urethral knife and injected, etc.

The existence and location of tender spots and reduction in the calibre of the urethra are best determined by means of the bulbous bougie. In chronic anterior urethritis, of both the soft and hard varieties, over-distention by means of the Thompson metallic sound, or the Oberlander or Kollmann urethral dilators, are often necessary. The conical steel sound is generally preferable and should be fully introduced so as to distend all diseased parts of the urethra. Dilatation is usually contra-indicated, in posterior urethritis of the soft or gonorrhœal varieties, though it may be used to advantage in many cases where there is chronic non-gonorrhœal thickening of the mucous membrane of the posterior urethra. The regular and methodical use of the steel sound will often be necessary to stimulate the parts, start up a healthy reaction and bring about absorption of the newly formed tissue. This is particularly true when granulations or chronic thickening of the urethral walls exist. When urethral lesions of this character occur a sound of good size can generally be introduced, though free bleeding often follows. A slight urethral hæmorrhage after the introduction of a sound, however, is not an unfavorable symptom, as it signifies a granular condition or weakness of the smaller urethral vessels which usually disappears after a few instrumentations, when a full sized sound can be passed without difficulty or causing hæmorrhage. Some-

times its introduction breaks the continuity of the mucous membrane of the canal and a little bleeding of no especial importance follows. The sounds may be introduced every five to seven days; each instrumentation should be followed by less reaction and more relief of the sensitiveness of the canal. If, however, chill and fever, with increased tenderness, and augmented urethral discharge follow, the use of the sound must be discontinued. In some instances the passage of the urethral sound may arouse an acute or chronic seminal vesiculitis or prostatitis. If, on the second introduction of the sound, there is increased pain, tenderness or reaction, it must not be repeated. In chronic urethritis some form of local application can generally, with advantage, be made immediately after the passage of the sound; in others, better results will follow if the sound and a local astringent applications are alternated every four to six days.

Occasionally, when the meatus cannot be properly enlarged or the patient objects to a meatotomy, the Kollmann antero-posterior or the straight urethral dilator will be preferable to the sound.

The cupped sound was much used before the introduction of the Ultzmann syringe and the endoscope; it is still occasionally employed to carry Glycerole of tannin, etc., into the deep urethra, where it is retained until the ointment dissolves and becomes spread over the diseased surface. Medicated bougies of various kinds have been tried, but have not proven of worth for continued use.

Rectal irrigations are frequently of much benefit in posterior urethritis. They should be employed before retiring, using the author's rectal tube as already described in the treatment of chronic spermato-cystitis. This method of local treatment is beneficial in all chronic inflammatory or neuralgic conditions of the posterior portion of the urethra and deep genitalia. In neurasthenic and neurotic conditions, cold water

may sometimes be substituted to advantage, the cold being applied through the Winternitz or the author's rectal psychophore. Massage of the prostate is often useful when the inflammation involves the posterior portion of the urethra and has associated with it some inflammation of the surrounding prostatic tissue, particularly if it assumes the neuralgic type. Massage should be given very gently, using the technique already described under chronic prostatitis. Massage is sometimes helpful in anterior urethritis, prostatic hyperæsthesia and congestion, but is contra-indicated in posterior gonorrhœal urethritis.

In chronic posterior gonorrhœal urethritis, sounds and dilators are almost always detrimental. This variety of inflammation yields to daily irrigations with Permanganate of potash, commencing with a strength of 1-8000, gradually increasing to 1-4000, urethral instillations of Argyrol, every three to seven days, give the most satisfactory results.

Chronic gonorrhœa urethritis is often amenable to the local application of the germicides, Argyrol, 1-50, or Protargol, 1-400 with an occasional antiseptic astringent douche, such as Bichloride of mercury, 1-20,000 to 1-10,000, or Nitrate of silver, 1-2000 to 1-1000. When the discharge is free from germs and contains only mucus and epithelium, an astringent urethral injection may be required to complete the cure. Non-specific posterior urethritis responds best to the local application of Thalline sulphate or Nitrate of silver. The intractable varieties of posterior urethritis are usually complicated by a varying degree of catarrhal prostatitis, vesiculitis or contracture of the neck of the bladder. The former generally responds to the persistent use of hot rectal douches and massage. Some, however, are only relieved by change of climate with, or without, an astringent injection to hold the discharge in check, while the general system is being built up. If the condition is accompanied by contraction of

the neck of the bladder, perineal section and bladder drainage may be necessary.

Chronic posterior urethritis which has been induced by unnatural sexual habits or excessive acts responds nicely to the introduction of the full-sized urethral sound, which should be retained for about three minutes. It opens the folds of the urethral mucous membrane and is advantageously followed with some astringent solution, Thalline sulphate or Nitrate of silver being particularly useful.

Urethrorrhœa usually slowly recovers if the exciting cause is removed. The stronger urethral irrigations, injections and instillations are generally harmful. Lloyd's Hydrastis, one drachm to the ounce of water, used by the patient night and morning as an injection, is often quite beneficial, as well as the introduction of the full-sized steel sound or the Winter-netz double current cold metallic sound every fourth day.

Symptomatically one of the following remedies is generally necessary to produce a complete cure :

Calcareo carbonica.—This remedy is frequently indicated in those of light complexion ; prominence of the abdomen ; good appetite ; nervous relaxation ; apprehension and anxiety about health ; dark circles around the eyes ; palpitation of the heart ; perspiration of the hands and feet ; flow of prostatic fluid after urinating and after stool ; urging to urinate aggravated by walking ; sensation as though the act were not finished ; much mucus in the urine voided ; urine turbid, with a white flaky sediment ; excessive sexual desire and physical deficiency ; more passion than physical power to carry out the act ; frequent nocturnal emissions.

Cannabis Indica.—Stitches and burning in the urethra before, during and after micturition. Sensation as though a discharge was present, with uneasiness and burning in the penis. Frequent desire to urinate with much urging ; dribbling of urine after straining has ceased ; has to wait some

time for the flow to commence ; stream stops and then flows on again ; oozing of white glairy mucus from meatus at night and during hard stool ; penis relaxed and sunken ; sticking and burning in glans ; painful erections after coitus ; thrill prolonged or may consist of intense burning without ejaculation ; during coitus small ejaculation, followed by acute pains in the loins ; disinclination to physical effort ; weakness from short walks, etc.

Cantharides.—Constant urging to urinate, with tenesmus, preceded by pain in the penis ; burning pain in the deep genitalia during and after coitus ; discharge of yellow pasty liquid from the urethra ; urine voided drop by drop ; cutting pains in the urethra before and after micturition ; seminal discharge bloody ; erections violent, painful and continuous, without sensation ; insanity of masturbators ; great increase of sexual appetite. Conditions due to gonorrhœa. It is often useful in the irritation of the verumontanum with frequent pollutions.

Clematis erecta.—Intense pain in the prostate ; frequent urging to urinate ; micturition slow, urine voided in a thin stream ; mucus discharge from the urethra ; urine milky ; boring pain in the penis on emission during coitus ; low-spirited, fear of impending misfortune, memory impaired. Useful in posterior urethritis resulting from gonorrhœa.

Conium maculatum.—Especially indicated for complaints caused by denial of carnal desires ; hypochondriacal, sad, anxious and low-spirited ; discharge from the urethra of fluid during stool and every emotion ; discharge of mucus from the urethra after urination ; frequent desire to urinate with burning pains at the neck of the bladder and along the urethra ; frequent micturition at night ; urine turbid, frothy and bloody ; seminal weakness with erethism and premature emission.

Ferrum metallicum.—Constant desire to urinate with pains in liver, kidneys and chest ; tickling in the urethra extending

into the neck of the bladder; tickling in the urethra when beginning to urinate which gradually extends along the whole length of the canal; soreness of the urethra on urinating; tickling of the glans with warmth and irresistible desire to urinate; urine light colored with whitish sediment. This remedy acts best in the weak and debilitated and the anæmic, and is particularly useful in the last stages of chronic posterior urethritis.

Graphites.—Gluey, sticky discharge from the urethra; biting and tickling in the urethra while urinating; urine voided in a thin stream as if the urethra was contracted; burning in the urethra between the acts of micturition; rawness and pressure at the root of the penis with desire to urinate; urine turbid and deposits whitish sediment. These patients usually have an associated unhealthy condition of the skin; tendency to general scrofulosis and constipation.

Kali bichromicum.—Discharge of prostatic fluid during stool; burning in the bulbous urethra and fossa navicularis before and during urination; urine turbid; thick milky with whitish sediment; pain in the penis; constricted pain at root of the penis on awakening in the morning; sticking pain in the deep urethra preventing walking; frequent micturition with burning along the urethra after the act. This remedy is particularly indicated in patients who have a general catarrhal tendency.

Kali bromatum.—Frequent desire to urinate with burning and smarting along the canal; micturition ending with spasmodic constriction of the urethra; sharp pains extending back into the bladder as though it were distended, followed by a whitish-yellow discharge; burning at the neck of the bladder with sensation of a ball being forced from behind; discharge of a thin liquid like the white of an egg; sexual excitement during light sleep with erections and emissions which awaken the patient; nocturnal pollutions followed by

great nervous irritability. This remedy is especially efficacious in sexual derangements the results of excesses when there is loss of memory, melancholia, impaired co-ordination, numbness and weakness of the lower extremities. Great nervous excitability following sexual abuse or imperfect coitus.

Hydrastis.—This remedy has often been prescribed and found beneficial, not only relieving urethrorrhœa ex libidine, but many of the associated symptoms.

Lycopodium.—Thin yellowish discharge from the urethra with burning after micturition; tickling in the urethra with constant desire to urinate; micturition ceases suddenly with a discharge of slimy fluid and pain in the urethra. These patients usually have more or less gastric disorder, are low spirited, somewhat prostrated and emaciated.

Mercurius corrosivus.—Sticking pain in the forepart of the urethra in the evening after urinating, when walking, accompanied by pain in the left side of the anus and in the left testicle; burning during micturition; itching in the orifice of the urethra with burning, biting and sticking pains through the canal during urination; micturition frequent, painful, difficult and ineffectual. This remedy is extremely useful in chronic urethritis either of the anterior or posterior portion of the canal.

Mezereum.—Sticking, crawling pains in the urethra with emissions of watery mucus and tenacious transparent fluid; discharge of a few drops of blood after micturition; tearing and jerking pains in the right side of the abdomen; stitches in the forepart of the urethra with cutting pains after micturition; urine dark, bloody, turbid, with a reddish sediment.

Nux vomica.—Discharge of tenacious mucus during micturition; pain in the neck of the bladder before micturition with burning and tearing during the act and pressure afterward; constriction in the forepart of the urethra extending backward; itching and burning in the urethra while urinat-

ing ; frequent, painful, ineffectual urging to urinate ; urine turbid, watery ; micturition followed by a discharge of thick whitish matter. All the symptoms are worse toward evening. Oversensitive to external impressions, habitual maliciousness, debility of the nervous system with gastric and bilious disturbances. This remedy is particularly indicated for posterior urethritis of the roue and alcoholic.

Selenium.—Seminal discharges from walking ; discharge of a watery, sticky substance before and during stool ; dribbling of prostatic fluid after urinating, walking, sitting, with a disagreeable sensation ; always obliged to urinate after stool ; sensation as if a biting drop were forcing its way out of the urethra ; relaxation of the general system. Symptoms are worse after sleep or physical or mental exertion, yet from exhaustion the patient wishes to sleep.

Sepia.—Discharge of milky fluid from the urethra after micturition and after a difficult stool ; burning in the forepart of the urethra after micturition ; tearing and smarting near the meatus ; burning within the prostatic urethra without the desire to urinate ; pressure in the bladder ; must wait a long time before the urine is voided. This remedy is frequently indicated in the passive congestion and inflammations of the deep urethra, frequently accompanied with bearing-down sensations and congestion of the portal circulation.

Staphisagria.—Prostatic irritation and posterior urethritis, the result of unnatural or perverted acts or thoughts ; useful to relieve the oversensitiveness, etc., resulting from masturbation, forced continence or the result of allowing the mind to ponder on impure literature. Apathetic condition ; prefers solitude ; desire to avoid the company of the other sex ; face appears sunken, eyes lustreless and deep set, hollow, surrounded by deep rings ; constant suspicion ; chip on the shoulder.

Sulphur.—Discharge of prostatic fluid from the urethra in

long threads after micturition and stool ; sticking pains in the forepart of the urethra in the morning ; dragging and pressure in the prostatic region after micturition with a sensation as though the urine were retained by contraction of the sphincter with the same sensation in the anus ; urging to urinate at night with cutting pains over the symphysis ; frequent urging to urinate with a voluptuous pressure reaching as far as the anus ; painful ineffectual desire to urinate ; erections infrequent ; involuntary discharge of spermatic fluid with burning in the urethra ; emissions premature with genitalia relaxed. This remedy may be considered as one of the polycrests in chronic urethritis. In cases where a slight gleety discharge persists, brilliant results may frequently be obtained by the administration of Sulphur tincture, in five drop doses, three times a day.

These are only a few of the symptomatic indications of the remedies mentioned. The totality of the symptoms and general scope of the drug indicated, together with the condition of the patient, must be carefully approximated. Many other drugs are frequently indicated in this most troublesome condition ; their special symptoms will be found under acute urethritis, chronic catarrhal prostatitis and in the "Classified Index" by Carleton and Coles.

STRICTURE OF THE URETHRA.

A stricture of the urethra may be defined as an unnatural narrowing of the calibre of the urethral canal. Two varieties are recognized, the spasmodic and organic ; the latter may be either congenital, inflammatory or traumatic.

Spasmodic Stricture.—Etiology.—Spasmodic strictures are the reflex result of local or general deviations from health. They are sometimes excited by a urethral lesion, particularly granulations and other diseased conditions in the anterior portion of the urethra. A spasmodic stricture often com-

plicates an organic stricture of large calibre. It may be due to reflexes from some external disorder, such as hæmorrhoids and other disordered conditions of the rectum, anus or sacrum, dislocation of the hip, or evoked by disease of the deep genitalia, upper urinary tract, a narrow meatus, etc. One author of note claims that most deep strictures are a spasmodic manifestation of a reflex from a narrowed meatus which will be speedily relieved by a meatotomy. Spasmodic strictures, due to a spermatocystitis, pyelitis, vesical calculus or growth, or some rectal disease, may persist until the exciting cause is removed. Chilling of the surface of the body, irritation of the skin, fright, anxiety and other strong emotions, the presence of an instrument in the urethra and particularly rough urethral instrumentation, may induce a temporary spasmodic urethral stricture. A highly sensitive nervous organization, the practice of perverted sexual acts and a rheumatic or gouty diathesis especially predispose to this variety of urethral stricture.

Clinical History.—A spasmodic stricture develops suddenly and immediately disappears upon the removal of the cause. It is a symptom and not a disease. It always relaxes under complete anæsthesia, and not infrequently it is impossible to differentiate it from an organic stricture until an anæsthetic is administered. Retention of urine, which is the most pronounced subjective symptom of the condition, is often due to a spasmodic contraction of the compressor urethræ or muscular coat of the membranous urethra with inability on the part of the patient to relax the same. This is well exemplified in those who are unable to urinate in the presence of their fellows or while traveling by rail. A large sound can usually be passed through a spasmodic stricture without difficulty; if grasped firmly by the spasmodic contraction easy pressure overcomes the spasm and the instrument passes through, whereas a small sound or filiform may be caught

and held fast. This is especially true when the stricture is excited by external reflexes. If traumatism is avoided during instrumental examination there will be no after disturbance, and the stricture will give no sense of grasping when the instrument is withdrawn. When excited by urethral lesions there is usually some pain accompanying the instrumentation, which is followed by a certain degree of inflammatory reaction. Organic and spasmodic strictures may co-exist. In spasmodic strictures, unless there is some associated urethral lesion, the urine is always clear and sparkling when voided.

Treatment.—The cause must be searched for and if possible removed. The systematic introduction of the full-sized steel sound, followed by a urethral instillation of a few drops of an aqueous solution of Nitrate of silver, 1-2000, blunts the sensibility of the urethra and often removes the tendency to spasmodic contraction. The general and sexual hygiene must be regulated and all irregularities in the reaction or density of the urine corrected. Urinary retention caused by spasmodic contraction of the urethral walls is usually relieved by hot sitz baths or hot fomentations applied to the genitalia. If the spasm is not relieved within a short time and retention of urine is present a catheter must be introduced into the bladder and the urine evacuated. If catheterization is impossible, supra-pubic aspiration must be resorted to. Under full anaesthesia the spasm generally relaxes and allows a silver catheter to easily enter. Assurance should always be given that the next urination will be normal.

Camphor or Gelsemium, five drop doses of the tincture, Aconite or Cantharis 1x, usually give good results. Belladonna, Nux vomica or Prunus spinosa may be called for. Traditional medicine advises Opium in one grain doses every hour until natural urination occurs.

Organic Strictures.—Organic strictures may be congenital or acquired through inflammation or traumatism. Congenital

strictures are caused by an accidental apposition of the genital groove during embryonic life. They are often located at the meatus, though they are not uncommon in other portions of the urethral canal. They may exist without injurious effects, but sometimes, even when not irritated, they produce pronounced reflex symptoms requiring a urethrotomy for relief. They always become of moment when the canal is invaded by disease. Often the meatus is narrowed by a little fold of tissue, which forms a sac just behind it, a condition which is easily recognized by inserting a probe down the urethra which will catch in the fold along the floor or roof as its point is carried along the mucous surface toward the meatus, or its existence can be demonstrated with a bulbous bougie. Congenital narrowings in the pendulous urethra are not uncommon, they do not differ materially in their symptomatological manifestations from acquired stricture, though they are more easily cured by a proper urethrotomy. They are the foundations of the old resilient strictures, which for natural reasons become irritated and react badly when treated by dilatation.

The urethral canal must not be considered as a tube of equal diameter throughout its whole extent and all narrowed points strictures; it has three natural constrictions, one at the meatus, one about an inch back at the termination of the fossa navicularis, and one about three or three and one-half inches from the meatus. When the urethral canal is overdistended, other bands can, with the Otis urethrometer or the bulbous bougie be detected, but they do not come within the scope of strictures unless an unusual narrowing exists. These bands can be seen standing out like brilliant white fibrinous rings with the mucous membrane bulging on either side when the canal has been inflated with air while using the Fenwick-Antal urethroscope.

Those who follow the strict letter of the urethral scale pro-

mulgated by Otis will be able to discover in almost every urethra normal bands of transverse muscular fibres which surround the urethra like a ferrule. They can best be demonstrated by the Stewart urethrograph or a urethral cast. When to them there is superseded an inflammatory condition the epithelium covering the areas become thickened, tumefied, or desquamated and the congenital stricture in this manner is often transformed into one of the resilient type.

Organic urethral strictures of inflammatory origin may develop at any point in the urethra, and, unless relieved by appropriate treatment, gradually become more pronounced. Organic strictures resulting from contraction of a peri-urethral inflammatory exudate are in 75 to 85 per cent. of a gonorrhœal origin, though sometimes they originate in a simple urethritis, or are the sequelæ of a chancroid, a chancre, a tubercular, a malignant invasion of the urethra, or a traumatism of the sub-epithelial tissues and the corpus spongiosum. The peri-urethritis may result from minute urinary leakage through a mucous membrane weakened by disease, nature throwing out a circumscribed inflammatory barrier to prevent the further burrowing of the escaped urine. Long-continued chronic urethritis may also be the source of a urethral stricture.

Traumatic strictures are not common in the penile portion of the penis. When present they may be due to the urethra having been torn by bending of the erect organ, from a false motion during coitus, breaking a chordee or its being severed by a knife or bullet. In the bulbous portion they may be the consequence of some urethral traumatism due to urethral instruments or the irritation or ulceration excited by some foreign body. The majority of traumatic strictures are located in the bulbo-membraneous region, and are the sequence of some external force applied to the perineum which mutilated or lacerated the urethra between it and the subpubic ligament. The

varieties of the external force are innumerable, such as **falling** astride a beam, a chair, the limb of a tree, a fence, a **wheel**, through a hatchway, etc. These injuries, when slight, **may** be overlooked and forgotten and only remembered when a strictured condition of the urethra necessitates surgical relief for the urinary retention. When the traumatism, which **may** come from external violence or fracture of the penis during coitus, is of sufficient degree to lacerate or rupture the urethra it may result in a traumatic stricture the treatment of which has received special consideration. Minor varieties of traumatic stricture are induced by unskilled instrumentation, forcible breaking of a chordee, and injudicious local treatment. The propensity of all urethral strictures to increase in thickness and to contract is largely due to the constant impact of the urine during micturition, upon the inflammatory obstruction hence the deepest strictures are generally the most pronounced.

Gross is of the opinion that urethral strictures are sometimes due to masturbation. While it is true that a congenital urethral stricture may be the cause of the habit, it must be believed that he has mistaken effect for cause.

For convenience in stating the location of a urethral stricture Thompson divided the urethral canal into three sections: (1) The bubo-membraneous, including one inch in front and three-fourths of an inch behind the junction of the membraneous with the spongy portion; (2) from the anterior limit of the first to within two and one-half inches of the meatus; (3) the first two and one-half inches of the canal. In the first section he locates 67 per cent. of all acquired urethral strictures, in the second 16 per cent. and in third 17 per cent. Thompson and Gouley state that stricture of the prostatic urethra does not occur. This is incorrect, as numerous strictures in this region have been reported and one has been demonstrated post mortem at the Metropolitan Hospital. In the

author's experience a smaller percentage of strictures has been discovered in the first and a larger in the second section than stated by Thompson. Strictures of inflammatory origin are usually situated in front of the triangular ligament (Fig. 70), although they are occasionally present in the membranous urethra.

Strictures situated at or near the meatus if not congenital are usually due to a chancre, a chancroid or a caustic, rarely

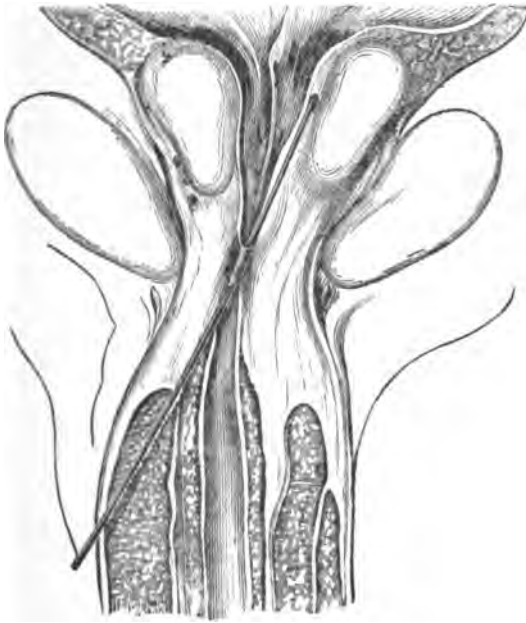


FIG. 70.—Annular Stricture. (Dittel.)

to a gonorrhœal invasion. When located in the pendular portion of the urethra they are generally the result of gonorrhœa, rarely congenital. In the bulb and bulbo-membranous region they are usually of gonorrhœal origin. In the membranous urethra they are ordinarily traumatic. In the prostatic portion they suggest a previous gonorrhœal invasion.

Pathological Anatomy.—The mucous membrane of the urethra covering the stricture may be slightly thickened, with some loss of polish, covered with granulations, without much increase of fibrous material in the sub-mucous tissue or the infiltration of the sub-mucous tissue may be excessive, resulting in the development of new connective tissue which replaces the mucous membrane and by contracting diminishes and distorts the calibre of the urethral canal, the extent depending upon the volume of the infiltration and degree of contraction.

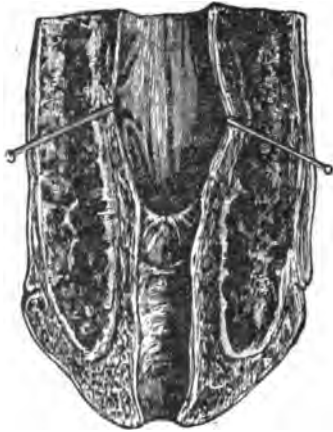


FIG. 71.—Linear Urethral Stricture. (Voillemier.)

When the plastic exudate thrown into the corpus spongiosum during a gonorrhœal inflammation is not absorbed, it becomes organized, contracts and causes stricture. Scar tissue following traumatism and inflammatory conditions external to the urethra may for the same reasons produce strictures of varying contours. For further pathology see chronic inflammatory urethral thickening.

Clinical History.—Urethral strictures may be linear, annular or irregular in form. The linear (Fig. 71) consist of thin bands of tissue thrown across the canal, possibly in a semi-circle or as a thin curtain having an opening of varying size. The opening may be central, though usually it is situated nearer the upper wall of the urethra. The annular (Figs. 70–72) are broad and flat, not over one-quarter of an inch in width and encircle the canal. The irregular include all other contours. The number of strictures present vary; as many as fourteen have been reported. Usually

there is only one, multiple strictures (Fig. 73) occurring in about 20 per cent. Clinically strictures of gonorrhœal origin are often multiple, while the traumatic are generally single.

If a blunt sound is passed through a stricture, when manipulated from without the stricture will feel like a band of firm, dense tissue encircling the instrument.

A true fibrous stricture of gonorrhœal origin may develop in one to four years. Sometimes as many as twenty years elapse before it induces symptomatic conditions calling for relief. A urethral stricture often exists for years without producing any noticeable symptomatic disturbances. When clinical manifestations appear earlier than one year after the urethral inflammation the obstruction is generally due to urethral granulations, the soft infiltration of a chronic urethritis, or to a chronic urethral inflammation which has been engrafted upon an unrecognized congenital urethral stricture. A strictured condition due to a rheumatic state of the system and consequent urinary changes, improper local treatment or slight trauma, is extremely slow in developing, while one from pronounced external violence is always followed by the rapid development of obstructive symptoms.

When a urethral stricture occurs the character of the urinary stream becomes changed, varying with the situation and the size of the obstruction. The diminution in the volume of the stream may be and often is so gradual that it is not noticed by the patient until some alcoholic or sexual excess, chilling of the surface of the body, or delay in answering the call to urinate, draws attention to the fact that a urethral obstruction exists, and it is then remembered that for a long time there has been a gradual increase in the frequency of the calls to micturate. The stream may be small, forked, or the urine may be voided only in drops. There may be complete obstruction. Even when the urine is voided in a fairly good

stream the last few drops are retained in the canal to dribble away later unless they are dislodged by mechanical means from the urethra before the organ is replaced. This dribbling of urine is due not only to the narrowing of the canal at the point of stricture, but to the dilatation which ultimately re-

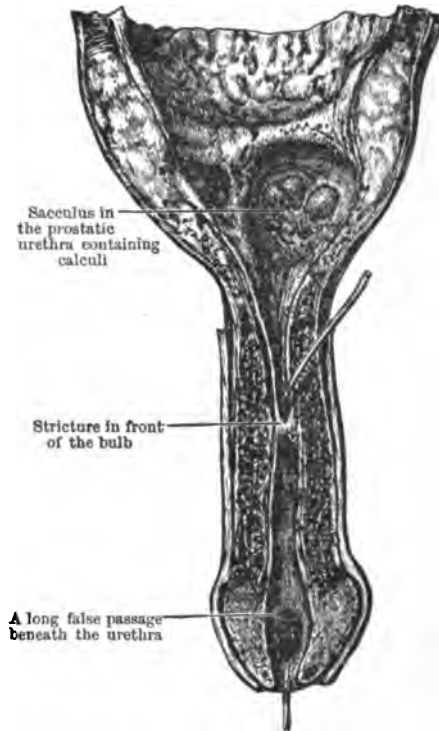


FIG. 72.—Annular Stricture of the Urethra. (Morris.)

sults behind it. It is in this dilated portion of the urethra that the drop or more of urine lodges to dribble away after urination. Its lodgement is facilitated by the strictured condition preventing the onward impulse of blood through the occluded corpus spongiosum which should occur at the end of

micturition and assist in expelling the urine from the urethra. The stricture also interferes with the general circulation in the corpus spongiosum and gives the blue color to the glans penis sometimes noticed.



FIG. 73.—Double-stricture of the Urethra in Penile and Bulbous Portions, also Showing Dilatation of the Prostatic Urethra.
(Morris.)

The strictured urethra also renders urination not only imperfect but painful. The small quantity of urine remaining behind the stricture after micturition undergoes decomposition, attacks the mucous membrane and excites inflammatory conditions and granulations. This condition explains the slight burning, smarting and uneasy feeling as the urine passes over this inflamed spot. As the inflammation progresses and the irritation continues, a mucoid secretion exudes from the diseased region which is the source of the morning drop at the meatus. As the stricture contracts further and the canal behind it dilates (Fig. 73) and becomes congested, the desire to urinate becomes more frequent. It is often the only symptom noticed. The pain accompanying urination may be located in the neck of the bladder, at the point of stricture or in the glans penis. Hæmaturia is sometimes present.

The gleety discharge may be the first manifestation of the urethral obstruction.

It may have continued from the time of the original gonorrhœa, though it is not infrequent that for a varying period there had existed a state of seeming health. The quantity of urethral discharge varies greatly and is subject to exacerbation depending upon the acidity of the urine

and upon sexual and alcoholic indulgences. In fact, it may only be noticed after such excesses.

If the urine of an individual having a urethral stricture be placed in a glass vessel, strands or flakes (*Trippefaden*) will be seen which soon drop to the bottom of the receptacle; microscopic examination will reveal them to be little scabs or collections of pus corpuscles which have become detached from the granulating urethral surface on or behind the constriction.

If the stricture develops gradually the resulting obstruction to the urinary stream is for some time overcome by a corresponding compensatory hypertrophy of the bladder muscle, though there is a positive loss of distensibility of the bladder walls. If the stricture develops rapidly and the urethral obstruction becomes excessive before hypertrophic changes are complete in the vesical wall, the bladder muscle being unable to perform the extra work put upon it, becomes stretched and over-distension and urinary retention may occur. When the urinary retention is due to some indiscretion, such as chilling of the surface of the body, alcoholic excess or a heavy dinner, which induces a swelling of the mucous membrane and closes the stricture, urinary retention may become suddenly complete and require immediate operative relief. Usually, however, this condition terminates in incontinence, the urine being voided continually drop by drop—a constant dribbling—incontinence of retention.

Urethral catarrh from any cause when once excited behind a stricture often travels back and involves the posterior urethra, causing frequent and painful micturition, the calls, if the condition is not relieved, often coming every fifteen minutes to an hour day and night.

In stricture of the urethra urinary retention may be the only symptom, the attack being brought about by a spasm or a slight inflammatory condition which disappears in a

few hours, the recurrence of which may be so infrequent that it is for the time overlooked or forgotten. Associated neuralgic and reflex pains in the urethra, glans penis, testicles, spermatic cord, back, hips, lumbar region, perineum, neck of the bladder and even in the legs, thighs and soles of the feet are not uncommon. Continued congestion behind the stricture often induces sexual erethism and nocturnal emissions. The erections may be painful and the ejaculation attended with pain, the seminal fluid being retained to dribble away after the act. Impotence may occur.

Strictures may be classed as of large and small calibre, the large being all those which allow of the passage of a No. 10 American or a No. 15 F. sound, those of small calibre only admitting sounds of a smaller size.

Strictures of small calibre, from their size, interfere much with the flow of urine and finally may cause structural changes in the bladder, ureters, pelves of the kidneys and in the kidneys themselves, such as cystitis, hypertrophy and atony of the bladder wall, reflex urinary paralysis and pyelonephritis. If the condition is permitted to exist for a long period constitutional symptoms dependent upon urinary toxæmia and septicæmia often occur. Complications in neglected urethral stricture are not uncommon, the most serious being urinary extravasation.

Urinary Extravasation.—It was formerly taught that when the pressure of urine behind a stricture reached a certain degree the infiltrated and diseased urethral tissues gave way, urinary extravasation and infiltration with momentary relief occurred, and that a chronic circumscribed urinary infiltration due to a persistent slight urinary leakage into the tissues through a break in the continuity of the epithelium produced the hard tumefied masses in the spongy portion of the penis surrounding the urethra, with a varying degree

of urethral narrowing especially in the perineal region, which often became of large size, and produced complete retention or excessive urinary extravasation. This explanation is inadequate because the bladder, when over-distended, is unable to exert a force sufficient to in any degree equal its normal expulsive power; when a urinary pocket is opened and its urethral orifice discovered, the urine retained is discharged in drops, never in a gush; urinary extravasation frequently occurs when the stricture is of large calibre; abscesses and urinary pouches often open in front of the urethral stricture and not behind it; further, urethral dilatations which occur in front of the stricture can not be due to urinary pressure.

These facts are, however, fully explained by infection, the determining factor of which may be local trauma, acute urinary retention, physical exposure, excesses or anything which undermines the general constitution and excites pyogenic changes either upon the surface or within the substance of the new-formed tissue. If the infection occurs upon the urethral surface involving a chronic catarrhal lesion, it may result in dilatation of the urethra, peri-urethritis or peri-urethral abscess. This complication may happen in front of, though usually it is behind the stricture. When the system is in a depraved condition or a pernicious microbic evolution appears, gangrene of the urethra may result.

When the infection commences within the strictured mass a peri-urethral abscess results, which may be absorbed, remain localized, quiescent and possibly become walled off, or, becoming active, may burrow and open into the perineum, scrotum, the surrounding tissues or into the urethra. In the latter case the pus cavity may become filled continuously or intermittently with urine, or filling with urine and bacteria, or the infection may spread rapidly resulting in urinary infiltration, extravasation, phlegmon, abscess or gangrene.

Urinary extravasations are divided into three general

classes : First, an infiltration anterior to the triangular ligament, with extravasation into the corpus spongiosum, from whence the urine may burrow into the penile structures, being confined by Buck's fascia, or it may break through the enveloping sheath and work its way to the dorsum of the penis between the layers separating the corpora cavernosa, the penis becoming at first swollen, pale and tense, and the latter inflamed and gangrenous. If it does not break through the sheath it may dissect its way backward into the perineum and scrotum, when if not liberated it may travel onward in the loose tissue over the pubes and up into the abdominal walls, or gravitate downward to the buttocks, the scrotum becoming shiny, bluish, cold and greatly swollen, and often from four to eight inches in diameter. If the condition is not relieved by operative measures gangrene of the parts with great destruction of tissue, exposure of the testicles, etc., will result. Second, extravasation of urine into the space between the anterior and posterior layers of the triangular ligament. When this occurs the urine burrows its way into the ischio-rectal space, extending laterally about the tuberosities of the ischium, and if not liberated results in gangrene. In the third class, the extravasation takes place behind the posterior layer of the triangular ligament between the pelvic and the perineal fascias, from whence it invades the pelvic cavity. The urine may dissect its way forward through the space of Retzius, backward along the sheath of the psoas muscle, or out of the pelvis and surround the muscular structures of the thighs. Gangrene follows, and, as the products of degeneration find their way to the surface, fistulous tracts are formed. These fistulæ, if neglected, become lined with granulations and are usually tortuous and of small calibre. If not properly treated, burrowing, abscess formation, etc., and death may be expected. When fistulous tracts form it is not unusual for Nature to close the old ones while the condition is

growing worse. In time the parts become filled with numerous fistulous tracts and the tissues are transformed into a thickened and tumefied mass. Urinary extravasation and fistulæ may result from suppurative Cowperitis, traumatism, or malignant or tubercular growths in the region of the deep urethra.

Urethral strictures are sometimes complicated by false passages usually due to rents in the urethral walls, caused by previous unskilled instrumentation. These false passages are generally located on the floor of the bulbous urethra and in front of the stricture, hence, they rarely induce urinary extravasation.

Prognosis.—Strictures of the pendulous urethra contract slowly and are generally curable. Strictures of the bulbo-membraneous region contract rapidly and many of them are incurable unless dilated at proper intervals, possibly during the life of the patient. Strictures of a gonorrhœal origin are comparatively slow in development and respond quickly to treatment. Those of traumatic origin contract rapidly and are difficult of cure. The more irregular, extensive and denser the cicatricial tissue composing the stricture the more difficult and prolonged will be the treatment necessary to cure or relieve. Strictures often cause, through involvement of the kidneys, chronic uræmia from which the patient may die before, during or after treatment for relief of the stricture. In the neglected, the constant calls to micturate and the agony of the act may finally result in exhaustion and death if not relieved by appropriate surgical methods. If urinary extravasation occurs, death may happen at once from shock or later from suppuration, abscess, gangrene, pyæmia and exhaustion.

Treatment.—The best general guide to the size of the individual urethral canal is the normal meatus. It usually admits a No. 20 American sound, which should pass through

all parts of the canal without difficulty. The Otis scale is somewhat larger and is as follows : Given a penis three inches in circumference in a state of repose, the urethra should admit a No. 30 French sound ; if three and one-quarter inches, a No. 32 ; three and one-half inches, a No. 34 ; three and three-fourth inches, a No. 36, and when four or more inches in a No. 40. Most authorities consider this to be over-distension, yet in chronic urethritis and stricture this degree of dilatation will generally be required before a cure can be consummated.

The existence of a stricture of the pendulous portion of the urethra may be demonstrated with a blunt-pointed sound, the full size of the normal meatus. If on attempting to pass it through the urethra it meets with an obstruction the sound should be removed and the degree of stricture and length of the obstruction ascertained with a bulbous bougie. To ascertain the extent of the stricture, a bulbous bougie is introduced until it meets the obstruction and the distance from the meatus noted ; if the bulb passes the stricture it should be gently withdrawn until its smooth base engages the posterior edge of the contracture and the distance from the meatus again taken. The difference between these two measurements gives the extent of the stricture. The Otis urethrometer may be used to advantage for diagnostic purposes, especially if the meatus is contracted, and the extent of the stricture and the full diameter of the urethral canal can be ascertained without performing a meatotomy. With this instrument, which is introduced when closed, and opened as may be required to distend the canal, the calibration of which is noted from behind forward on the dial plate.

Urethral Sounds.—A conical steel sound less than a No. 15 French in calibre, on account of the danger of causing a false passage, should not be employed in urethral instrumentation except by the most experienced operator. The blunt-pointed steel sounds are often necessary, not only for diagnostic pur-

poses, but for relaxing spasmodic strictures. Conical shaped sounds are used for dilating, or, more properly speaking, to dilate special parts of the urethra, induce a reactive inflammatory condition, and promote absorption of the strictures. They are introduced in the following manner: The patient is placed on a table in the dorsal position, made as comfortable as possible and his mind diverted from himself. The surgeon stands on the patient's left and holds the sound

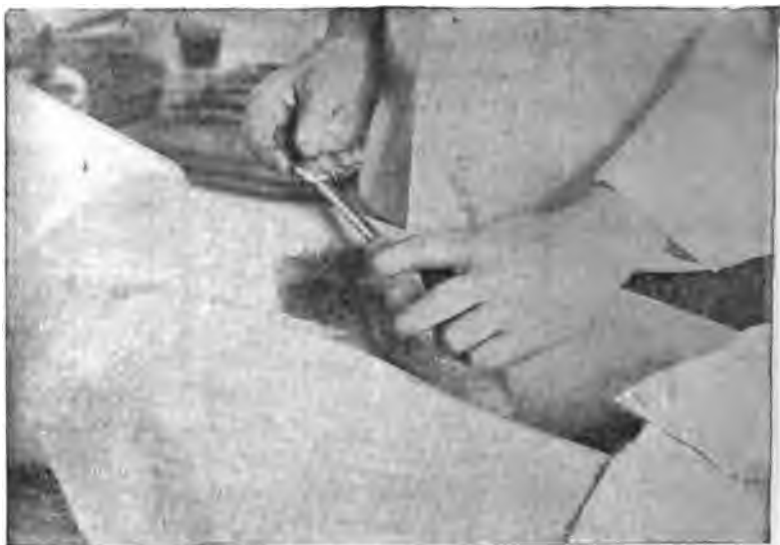


FIG. 74.—Introducing the Urethral Sound. The Shaft Being Parallel With Poupart's Ligament. (White and Martin.)

(previously warmed and well lubricated with Lubra septic or sterile white Vaseline) in his right hand as he would a penholder, grasps the glans and penis with the thumb and forefinger of the left, and balances the sound on or over the inguinal region, introduces it (Fig. 74) with the handle well down, the urethra being allowed, as it were, to swallow the instru-

ment. When it has passed in about an inch beyond the curve, the distal point will be practically at the opening of the triangular ligament; the handle is then carried to the median line over the abdomen (Fig. 75) and brought down towards the feet, the scrotum being elevated at the same time with the disengaged fingers and the handle of the sound raised (Fig. 76).

As the point of the sound enters the bulbous urethra the scrotum should be relaxed. If the advance of the instrument



FIG. 75.—Introducing the Urethral Sound. The Shaft Carried Inward to the Middle Line of the Body. (White and Martin.)

seems impeded, slight pressure on the mons veneras (Fig. 77) will facilitate its entrance into the bladder as the handle is carried to a right angle with the body (Fig. 78). The point of the sound must always follow the roof of the urethra. This also prevents it being caught in the dilated bulbous portion and accidentally thrust through the wall of the



FIG. 76.—Introducing the Urethral Sound. The Shaft of the Sound Swept Upwards and the Fingers of the Left Hand Placed Against the Perineum. (White and Martin.)

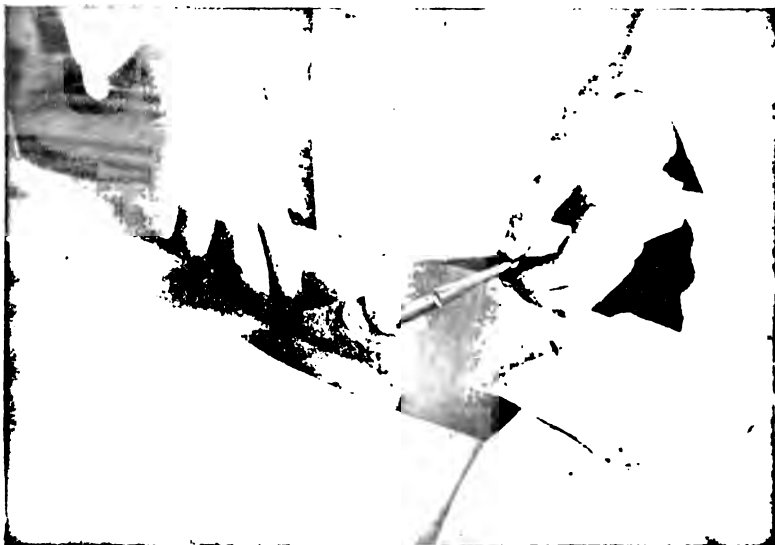


FIG. 77.—Introduction of Urethral Sound. The Handle of the Sound Taken in the Left Hand, the Fingers of the Right Hand Making Downward Pressure at the Root of the Penis. (White and Martin.)

urethra and inducing a false passage. Force must never be used in urethral instrumentation, the sound, if over a No. 15 French in calibre, being always allowed to enter by its own weight; if force is used a false passage may be produced. After the sound has entered the bladder it should be immediately removed with the same care and gentleness used in its introduction, as nothing is gained by allowing it to remain in the canal. Excessive and too



FIG. 78.—Position of the Sound Showing That Its Tip Has Entered the Bladder. (White and Martin.)

frequent instrumentation is injudicious and often detrimental. When steel sounds are being used for the purpose of urethral dilatation they should never be reintroduced until one or two days after the inflammation produced by the previous passage has ceased and absorption has occurred.

The character and location of a urethral stricture is of the utmost importance in selecting the proper variety of treat-

ment. Many methods have been advised—gradual dilatation, divulsion, urethrotomy, excision and electrolysis.

Gradual Dilatation.—This method is advisable when the tissues are soft and yielding, the stricture being due to a round-celled infiltration into the urethral wall, or if it is the sequel of urinary leakage and infiltration and the canal will admit of the introduction of a No. 15 French sound. It is also the necessary after-treatment of a urethrotomy for a fibrinous or congenital stricture. Gradual systematical dilatation is usually successful in stricture of the deep urethra which will admit a No. 15 French sound. Gradual dilatation may be used in all who object to radical surgical relief, and is



FIG. 79.—Thompson's Conical Steel Sound.

for a time seemingly successful, but in the majority, unless continued at stated intervals, the stricture and its symptoms will return. Gradual urethral dilatation consists in introducing dilating instruments at stated intervals through the abnormally narrowed part of the canal. A recoil indicates that the sound has met with an obstruction and on withdrawing it no resistance is offered. If, however, the sound has engaged in a stricture, there is, when it is removed, a sensation as if it were snugly held. If the sound engages the stricture and it will not pass through an instrument of smaller calibre must be substituted. A urethral stricture which will admit of a No. 15 French is best dilated with the Thompson conical steel sounds. Smaller sounds are liable, if any force is used, es-

pecially in the deep urethra, to break through the floor of the canal and make a false passage, inflame the stricture induce an epididymitis or cause a urethral chill and fever.

Conical sounds (Fig. 79) must be constructed of steel, be nickel-plated and highly polished, with the lower portion conical and curved to correspond to the segment of a circle three

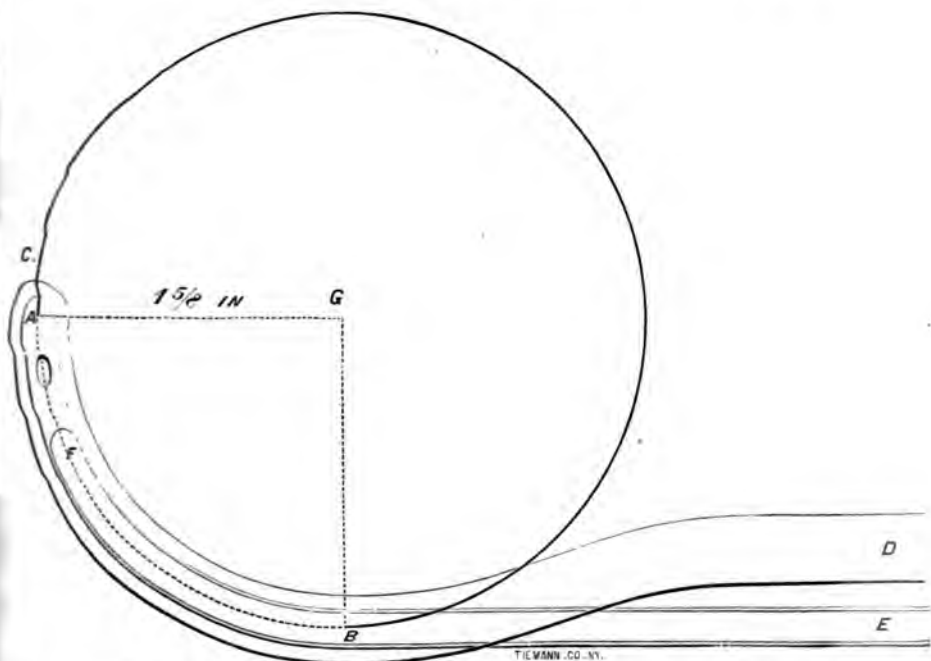


FIG. 80 A, B.—Curve of the Male Urethra. A, B, E, Thompson Curve ; F, B, E, Short Curve ; C, B, D, Benique Curve.

and one-quarter inches in diameter (Fig. 80 A. B); the length of the curve of the instrument to correspond with the suprapubic curve (Fig. 80 A, B, E) should be two and three-quarter inches across. Of late years a shorter curve (Fig. 80 F, B, E) has been in use and often to advantage. The conical part must

be confined to the curved portion, and in a No. 15 French it should extend through seven sizes, measuring nine millimeters just back of the tip; a No. 33 French, through thirteen sizes, and all others in similar proportion.

Urethral sounds numbered by the French scale indicates the number of millimeters of its circumference. In the American scale a unit represents one-fiftieth of an inch in diameter; in the French one-third of a millimeter. A No. 10 American is equal to a No. 15 French, a No. 20 American to a No. 30 French. A No. 18 French or a No. 12 American equals a No. 10 English, and a No. 30 French or a No. 20 American equals a No. 18 English.

The steel sounds can be used every fifth to seventh day, but should never be employed at a less than three day interval, the period depending upon the result of the inflammatory reaction excited and its subsidence. At each successive instrumentation, the first sound introduced should always be two sizes smaller than the largest one introduced at the previous sitting; two, three or four sounds may be introduced one after the other, as judgment may dictate. Often, after a fairly close fitting instrument has been passed, a second and larger can be immediately introduced with less discomfort than the first.

In those who have no especial Cocaine idiosyncrasy, when urethral dilatation is contemplated, the instrumentation should be preceded by a urethral injection of two drachms of a warm aqueous 2 per cent. Cocaine and 1 per cent. Carbolic acid solution which should be retained in the urethra for about one minute. This relieves sensibility, pain, liability to spasm, cleanses the urethra and acts as a mild antiseptic. Instrumentation should be followed by a urethral douche of a warm saturated aqueous solution of Boric acid, and if gonococci are present or suspected, by a 5 to 20 per cent. solution of Argyrol.

To prevent urethral fever, etc., it is always advisable before beginning the systematic introduction of sounds to render the urine aseptic for at least one week before the first treatment, and to keep it so for some length of time afterward by administering Camphoric acid, one grain in capsules, three times daily; Boric acid, five grains, four times a day; Urotropin, seven and one-half grains in two-thirds of a glass of water before meals, or a capsule containing ten drops of the Oil of eucalyptus, and after the first few instrumentations, five drops of Aconite ix. Urethral fever may be the result of shock. It is not of infrequent occurrence when kidney lesions are present. That proper precaution may be observed, the urine should always be examined before any urethral instrumentation. Acute epididymo-orchitis not infrequently follows urethral instrumentation and may contra-indicate further treatment along this line.

Strictures of the pendulous portion of the urethra other than congenital can be relieved, and if due to a small celled infiltration of the urethral wall cured by continual methodical urethral dilatation, but in the fibrinous variety, no matter what the immediate results may be, sooner or later, unless dilatation is continued at stated intervals—every three to twelve months, as the individual may require—contraction is again liable to occur.

Treatment by dilatation is slow, but it will often relieve the symptoms and does not keep the patient from business.

Dilatation of a urethral stricture may be accomplished by means of a urethral dilator, an instrument the calibre of which can be increased after its introduction into the urethra by turning a screw. Numerous urethral dilators have been presented, some constructed with two lateral blades (Otis, Oberlander and the author's), others with four (Kollmann), which, by an arrangement of hinges and a screw, may be separated and the instrument expanded at will, the size of the

expansion being accurately marked on a dial near the handle. The dilator is often of much service when a narrowed *meatus* exists and when from any cause it is not expedient to *incise* it. The straight instruments are used in the penile urethra, the curved in, the bulbous region, and those having a *Benique curve* (Fig. 81) in the deep and prostatic portions. They require the utmost care in their manufacture and must be made of the best steel and with the finest workmanship. They should be cleansed and dried immediately after using, then oiled *and* dried, or they will soon become rusty and useless. Before introduction, the urethral portion of the instrument is *inclosed* in a rubber cover slip, which can be easily made aseptic by boiling; it prevents possible infection and protects the mucous membrane from injury and from being caught as



FIG. 81.—Kollmann's Double Curved Urethral Dilator.

the blades of the instrument are closed or torn when the instrument is withdrawn. Instruments which allow of irrigation with dilatation have been constructed and used, but, except with their originators, they have not as yet been well received by the profession.

The dilator is introduced into the urethra with the same general technique as the sound. When in place dilatation is accomplished by slowly turning to the right the screw which controls the separation of the blades. As the dilatation advances the patient experiences a sensation of burning and pricking in the parts. When this occurs a rest should be taken until the disagreeable sensations subside. The dilatation is continued with periods of rest until the desired degree

of dilatation as recorded upon the dial is reached. After the expanded instrument has remained in place a few minutes it is closed, by turning the screw to the left. It is not advisable at any seance to dilate the urethra more than two to four millimetres in circumference beyond the point reached at the previous sitting, and it must always cease as soon as pain is experienced. These dilatations should be repeated every ten to fifteen days, and in the meantime local treatment of the existing blennorrhœa, as advised under chronic urethritis, can be followed to advantage. This method of urethral dilatation is contra-indicated during an acute urethritis; it must be conducted with the greatest caution where a posterior urethritis, accompanied with an epididymitis, or a prostatitis exist, and in all tubercular and suspected tubercular conditions. Urethral hæmorrhage following urethral dilatation is not un-



FIG. 82.—Olive-point Gum Elastic Sound.

common. It usually ceases without special treatment; if persistent it may be controlled by pressure or by the urethral injection of a 1-1000 Adrenal chloride solution.

Strictures of Small Calibre.—A strictured condition of the urethra which will not admit a No. 15 French or a No. 10 American sound should be dilated by means of French or English gum elastic sounds (Fig. 82) until the stricture will admit a No. 15 French sound. The progress is slow, though the instrumentation can be repeated to advantage every four to five days. These instruments are also useful when the urethra is tender. They are particularly advisable for the first urethral dilatation. Their surfaces must always be highly polished and not sticky or damaged by age. A No. 16 F. or larger should have a moderate degree of stiffness in the body,

with a flexible olivary end and neck. Between No. 12 and No. 16 F. scale the sound should be more flexible, taper moderately and have a blunt end ; between No. 8 and No. 12 F. they should be pliable. Smaller instruments than a No. 8 F. are rarely useful. The soft gum elastic sounds are useful in tortuous and sensitive canals in smoothing as it were the canal and facilitating the introduction of large instruments.

If it is impossible to introduce a flexible instrument or the canal is greatly narrowed and tortuous, filiform bougies may be necessary. They should be made of whalebone about three or four millimeters in circumference and tapered to an olive-shaped point (Fig. 83). If one of these instruments fails to pass through the canal, either an obstruction has been met or the filiform has become engaged in a false passage ; the in-

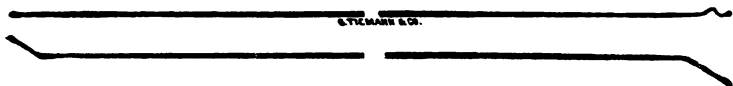


FIG. 83.—Gouley's Whalebone Guides.

strument is so small, a spasmodic stricture could play no part ; force should never be used. Where the straight filiform cannot be introduced, one with a bent or cork-screw end (Fig. 83) may be made to engage. If these manipulations are unsuccessful two drachms of sterilized Olive oil should be injected into the urethra and a number of straight and bent filiforms, sufficient to fill the canal, introduced ; by gently manipulating and rotating them in succession one will generally find entrance through the stricture into the bladder. On the third or fourth day thereafter the filiform can generally be reintroduced with ease and a larger one may follow. Occasionally it is advisable to tie the filiform into the urethra producing continuous dilatation, when the urine will trickle out by its side. After three or four days the filiform is removed, the patient

having been kept in bed, and a larger urethral instrument introduced.

False passages are usually overcome and a sound may be successfully introduced by first filling the original canal and the false passage with fine filiform bougies.

If the canal is particularly tortuous, a second obstruction may be encountered; this, however, is usually easily overcome by turning the instrument slightly upon its axis. Sometimes it is advisable, particularly in the pendulous or scrotal regions, to engage the filiform through the endoscope. When very small strictures are met with and rapid dilatation is deemed advisable, the Hunter's filamentous wedge (Fig. 84) can be used to advantage. This instrument consists of a bougie and filiform combined, made of whalebone tapering from a body



FIG. 84.—Hunter's Filamentous Wedge.

of about eight to ten millimeters in circumference to a filiform prolongation, which will curl up inside the bladder as the body engages and dilates the stricture. They are preferable to those made of two pieces (a filiform screwed on to a steel sound such as Guyon's, Fig. 85), as the filiform sometimes becomes unfastened or breaks off inside the bladder.

Another method of rapidly dilating these narrow strictures consists in threading, over an engaged filiform, a Gouley's tunnelled sound (Fig. 86), an instrument formed like an American short sound. Through the tip, which is more pointed than the ordinary steel sound, is a small circular opening of sufficient size to allow of the easy introduction of a filiform guide, while along its back is a groove. After threading a small-sized Gouley tunnelled sound over the engaged filiform it is passed down to and through the stricture,

the fine filiform bending upon itself in the bladder and rapid dilatation is accomplished. If necessary, a number of these sounds in increasing sizes can be used in succession with safety. After a few days the French or English elastic sounds should be employed and the dilatation continued. On ac-

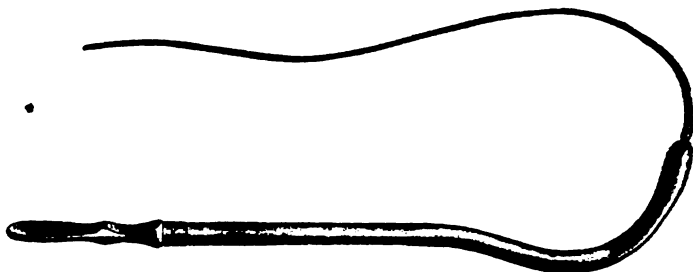


FIG. 85.—Guyon's Metal Urethral Sound With Filiform Guide.

count of the tunneled instrument being threaded over the filiform, considerable force can be applied without much danger of causing a false passage. The Gouley tunneled sound is manufactured in sizes varying from eight to eighteen



FIG. 86.—Gouley's Tunnelled Sound.

millimeters in circumference. This instrument is also very useful as a guide in the operation of perineal section when it is impossible to introduce other instruments through the urethra.

The symptoms of stricture, even when instrumentation ap-

pears to be the only indicated treatment, will often be greatly ameliorated by the exhibition of the indicated remedy. Strictures of small calibre, when indiscretions are avoided, may go on without special annoyance, but chilling of the surface of the body, exposure or over-indulgence of any kind may cause congestion of the parts and produce mechanical retention of the urine. This condition, if not at once relieved, may be followed by over-distension and atony of the bladder. If a catheter cannot be introduced, relief must be obtained with the aspirator, the needle being introduced in the median line about half an inch above the symphysis, and the bladder partly emptied; it should never be at once entirely evacuated as violent shock may result. Aspiration should be followed by the administration of a stimulant and the temporary application of the abdominal bandage.

Divulsion.—This method of treating strictures is nearly obsolete. It consists in forcing a wedge-shaped tunneled instrument on a guide through the strictured mass and tearing it open in an irregular manner. In fibrinous strictures it is inexact and extensive cicatrices may follow its employment. In soft strictures divulsion has no advantage over gradual dilatation with sounds and is liable to be followed by septic conditions. Occasionally, from want of time, and when a rapid cure is desired or when urethral fever follows instrumentation, divulsion with Thompson divulsor may be permissible. This method has, however, been largely superseded by internal urethrotomy, using an Otis urethrotome, an instrument which dilates and cuts at the same time.

Electrolysis.—Newman claimed to cure urethral strictures by slowly dissolving them by means of a weak galvanic current, and Fort has advocated the use of a blunt platinum knife electrode similar to the *maisonneuve* to sever the bands. The author's personal experience in the use of these methods and with the numerous cases which have been treated by others

with the Newman and Fort electric process, in which he has been later called upon to perform a urethrotomy in order to restore the urethra to its normal calibre, leads to the opinion that other methods of treatment will give better immediate and future results.

Newman's electrolysis sound is used with a galvanic current of not more than six milliamperes. The negative pole is connected with the sound and the positive with a large pad placed over the sacrum. The sound should be lubricated with soap and water. While the current is on, easy pressure should be made through the sound against the stricture, but force should not be employed. The application should not exceed ten minutes and is not to be repeated at less frequent intervals than once in five days. A second sound must not be introduced at the same sitting.

Urethrotomy.—This term signifies the treatment of a stricture of the urethra by incision. When performed from within outward it is designated as an internal urethrotomy; when from without inward, an external urethrotomy. Internal urethrotomy is only advisable for strictures involving the pendulous and scrotal regions; the external is the proper method of relief for those situated in the perineal and membranaceous urethras. Strictures at and within a short distance of the meatus should usually be incised on the floor of the urethra; this operation is called a meatotomy. Those situated between this region and the bulb should be cut on the roof, provided the incision is made by a knife introduced through the meatus. An internal urethrotomy may, when performed in conjunction with an external urethrotomy, be made upon the urethral floor as the associated perineal urinary drainage eliminates the danger of urinary infiltration. Strictures in the bulbous and deep urethra are incised upon the floor of the canal from without inward through the perineum. Occasionally it is advisable to combine it with an internal urethrotomy

upon the roof as advised by Harrison. A urethrotomy is indicated when the urethral stricture is fibrous, congenital or it is impracticable to dilate from the advent after each instrumentation of urethral fever, etc. In some of the more severe traumatic structures, however, it is not sufficiently radical, though if proper after-treatment is followed, a cure can be generally expected. Urethrotomy is always contra-indicated in strictures of tubercular or syphilitic origin.

Meatotomy.—In the division of a coarcted or strictured meatus the external opening of the urethra is enlarged in a downward direction toward the frenum, the incision being made exactly in the median line in order to give it as far as possible, a normal appearance. The glans penis being grasped and pinched between the thumb and first finger of the left hand, an incision extending from the lower opening of the meatus down to the frenum is made with the scissors; then a straight blunt-pointed knife, held in the right hand in the same position as a penholder, is introduced into the urethra and the stricture incised upon the floor of the urethra against the forefinger of the left hand until all resisting tissue is divided, care being taken not to exceed the incision made by the scissors or to cut through the walls of the penis. The opening should be tested with a proper-sized bulbous bougie and if all bands have not been divided, further division will be necessary. The operation may be performed with a Civiale's meatotome, which may be gauged to the proper size from measurements taken of the canal with the Otis urethrometer, or approximated from the Otis urethral scale. Sometimes to open existing urethral pockets it is necessary to make the incision in the roof of the urethra. The opening should be made two millimeters larger than the normal canal to allow for ultimate retraction. Hæmorrhage, as a rule, is not excessive; when profuse it may be controlled by the application of two pieces of veneer board, about two by six inches in size,

placed one on either side of the penis, and the pressure regulated by rubber bands or a piece of twine. After the bleeding has stopped they should be removed. Sometimes hæmorrhage after micturition or during erection necessitates their reapplication. The lips of the meatus may be pressed together and sealed with a drop of Collodion, the pressure being continued until the Collodion dries. This operation is

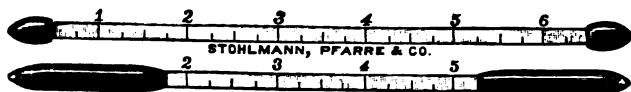


FIG. 87.—Weiss Urethral Sound.

simple and not very painful and may be performed under local anæsthesia, a 2 per cent. Cocaine and 1 per cent. Carbolic acid aqueous solution being employed. A full-sized Weiss (Fig. 87) or meatotomy sound (Fig. 88) must be passed daily for a week, and again on the fourteenth and twenty-first days, or the parts may again become coarcted. This operation applies also to all urethral strictures situated within three-



FIG. 88.—Piffard Meatotomy Sound.

fourths of an inch of the meatus. These strictures are usually of congenital origin though frequently in the fossa navicularis they are of acquired nature, being the sequence of some severe local inflammation in the urethral or the result of irritation from the use of long-nozzled syringes.

Internal Urethrotomy.—This operation should be performed with an Otis straight urethrotome (Fig 89). Many modifications of this instrument have been recommended

without demonstrated superiority. This urethrotome is strongly made and easily rendered aseptic by boiling. The anterior and posterior borders of the stricture having been located with a bulbous bougie or the Otis urethrometer, the incision is made along the roof of the canal, cutting into the intercavernous space where the danger of urinary infiltration and infection are less than in the subcutaneous tissue of the floor. To allow for subsequent contraction it should exceed by about two millimeters, the normal calibre of the canal as indicated by the urethrometer, the urethrotome is introduced through the urethra three-fourths of an inch beyond the posterior limit of the stricture. As the lower blade of the instrument remains stationary when the instrument is opened, the upper, as the urethrotome is opened, which con-



FIG. 89.—Otis Dilating Urethrotome.

tains the knife is drawn forward. If this fact is forgotten in locating the urethrotome, the thickest and most important portion of the strictured band may escape division. The urethrotome having been properly located, the penis is extended and held in the median line by an assistant. The instrument is opened to the desired size, as indicated by the dial, by turning the set screw to the right, the knife in the groove is exposed and drawn forward through the stricture to a point about half an inch beyond its anterior border. The knife is then disengaged by pushing it back to its original position and the dilator partly closed by turning the set screw to the left and the instrument withdrawn. Care must be observed to cut only the strictured part of the canal and not the

entire roof; if the latter is cut permanent curvature of the penis may result. When the first incision is not sufficient the strictured mass must again be put on the stretch and the band incised. Before the operation the canal should be douched with a warm aqueous solution of Boric acid, and anesthetized with an aqueous solution of Cocaine, 2 per cent., and Carbolie acid, 1 per cent. After the operation it should again be douched with the Boric acid solution or with one of Nitrate of silver, 1-5000.

When the anterior urethra is so narrowed that a No. 20 French bulbous bougie, which is the size of the closed Otis urethrotome, cannot be introduced, a Maisonneuve urethrotome (Fig. 90) must be employed to enlarge the calibre of

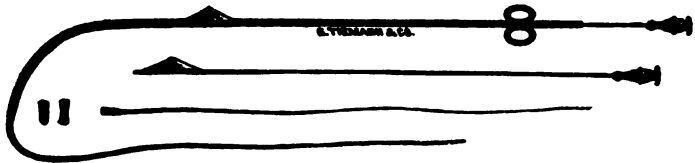


FIG. 90.—Maisonneuve Urethrotome.

the canal; this incision should preferably be made upon the floor of the urethra. The Maisonneuve urethrotome consists of a slender steel rod with a groove for the knife and its wire staff. At the apex of the rod is a conical end or a screw to which can be attached a filiform bougie to guide its introduction. The knife is formed like an obtuse triangle with blunted apex and sharp edges. When the shaft is in place and the penis extended on the instrument by an assistant the knife is introduced through the groove and slipped down through the stricture, making a sufficient opening through the constricted canal from before backwards to admit of the introduction of the Otis urethrotome, the blunted apex of the knife preventing injury of the normal urethral wall.

After an internal urethrotomy hæmorrhage is sometimes profuse, particularly if the incision has deviated somewhat from the median line of the urethral roof. It may persist for a number of days and be severe. It can be controlled by placing the penis over the pubes in the middle line, bringing the scrotum upward and forward over the penis and allowing the testes to fall to their respective sides of the penis and applying a compress made of gauze and cotton—compressed by a roller bandage which when completed resembles a policeman's short night-club, being about six inches long and one and one-half inches in diameter—along the urethra from the anus to the end of the penis where it is firmly pressed against the perineum scrotal and penile portions of the urethra by a crossed perineal bandage, which is applied from behind forward to hold it in place. This compress should be released as required to comply with the calls to micturate. Bleeding may be controlled by means of the Bates' urethral hemostat. This instrument consists of a thin rubber tube arranged around a small catheter with an inlet and an outlet, through which iced-water can circulate freely, or the tube can be filled with air or water and the hæmorrhage stopped by pressure; the urine at the same time can be allowed to escape by unscrewing the cap of the catheter. The hæmorrhage may also be controlled by the injection and retention for two minutes in the urethra of a drachm or more of a solution of Adrenal chloride 1-1000 to 5000. When hæmorrhage is anticipated the use of this solution before performing the operation will prevent unpleasant complications.

On the fourth day following the operation and every third day for the succeeding two weeks a full-sized sound must be passed through the urethra, and once a week thereafter until healing is complete and the tissues have become soft and pliable and all symptoms have disappeared. If irregularities in the canal persist the weekly introduction of the proper

sized conical steel sound for several months may be necessary to complete the cure.

Chordee after the operation is not infrequent. Incurvation of the penis of varying degree, sometimes sufficient to interfere with coitus, may follow. This generally disappears in a few months; sometimes, however, owing to non-absorption of the portion of the cicatrix on the floor of the urethra, it becomes permanent, the lower side of the penis lacking the flexibility given the upper portion by the incision of the band of contracting tissues. It may necessitate a transverse incision of the urethra in the scrotal region to permit of proper extension of the parts. These eventualities *must* always be told to the patient before performing an internal urethrotomy, or he may blame the surgeon for an unavoidable deformity. There is but small danger from an internal urethrotomy if it is performed with due regard to asepsis and antisepsis, the kidneys are in good condition and proper attention is given to hæmorrhage which may occur during sleep. The patient should remain in bed for at least four days after the operation.

External Urethrotomy.—In the bulbous and deep portions of the urethra, strictures of large calibre, and, when possible, those of small calibre unless resilient, should be dilated. When this is impossible and retention of urine or its extravasation from rupture of the dilated portion of the canal back of the stricture or from pyogenic infection occurs, external urethrotomy will be necessary. An internal urethrotomy is never indicated in this region, as it has often been followed by fatal urethral hæmorrhage, urinary extravasation and septic absorption. External urethrotomy gives free drainage and practically eliminates the danger from hæmorrhage, etc.

If the stricture will admit the passage of a urethral guide the operation can generally be easily performed. Particular attention should be paid, if possible for some hours previous

to the operation, to the condition of the kidneys and to rendering them active by administering diluents; the bowels should be moved by frequent rectal enemas. Complete general anæsthesia having been produced (local anæsthesia being rarely permissible), before placing the patient in the lithotomy position, the grooved urethral staff (Fig. 91) with a full curve is introduced into the urethra, passed into the bladder, and given in charge of an assistant. After proper tabling and toweling an assistant, with one hand, holds the staff exactly in the median line and in such a way as to press out the perineum, while with the other hand he elevates the scrotum. A vertical incision about one inch in length is made exactly in the median line



FIG. 91.—Grooved Urethral Staff.

of the perineum, terminating three-fourths of an inch in front of the anus, the staff being the objective point. When that is reached, the knife is allowed to run in the groove of the staff, and the urethral incision is prolonged in the direction of the bladder until the strictured mass is divided. A narrow, probe-pointed (Teale's) gorget (Fig. 92) is then introduced into the wound, its point being made to follow the groove in the staff until it enters the bladder, or, after the urethral staff is in place, the forefinger of the left hand may be inserted in the rectum with the ball of the first phalanx directed forward toward the perineum at a point just back of the sphincter. The scalpel, with its sharp edge directed upward, is inserted into

the perineum one-half inch in front of the anus or just external to the sphincter muscle, the forefinger in the rectum guiding the point of the scalpel as it is pushed down to the groove in the staff. When the staff is reached the blade of the knife is turned down, the finger removed from the rectum, the staff grasped by the left hand and rotated further along the canal, the knife being made to follow the staff, cutting along the floor of the urethra and through the stricture.



FIG. 92.—Teale Gorget.

A grooved director is then introduced by the side of the knife into the groove in the staff, the knife withdrawn and the external opening in the perineum increased sufficiently to admit the finger. The staff is then removed. If points of undivided cicatrix remain the Blizzard knife (Fig. 93) or a straight blunt bistoury should be introduced along the grooved



FIG. 93.—Blizzard Knife.

director and the cicatricial bands divided upon the roof or the floor of the canal as may seem expedient, and a full-sized sound introduced into the bladder through the urethra.

Co-existing strictures of the anterior urethra, may be cut upon the urethral floor through the perineal opening, as the perineal drainage will prevent urinary infiltration, the location of the incision is advantageous as it precludes the possibility of chordee and incurvation.

The stricture having been severed a 34 to 38 F. soft rubber perineal drainage tube having a conical blunt perforated end (Fig. 94), and a good-sized opening through its wall, about three-quarters of an inch from its end, is introduced into the bladder, the lateral opening being directed upward. The bladder is then freely douched with a warm saturated aqueous solution of Boric acid. The end of the tube must be located about three-quarters of an inch within the bladder; if further than this it may cause pain and annoyance, if less it is liable to work its way out and allow of urinary retention, pain, etc. The perineal drainage tube may be retained in proper position by a large safety pin piercing it at right angles, the pin preventing the tube from being pushed further into the bladder



FIG. 94.—Perineal Drainage Tube With Lateral and Terminal Eyes.

while the external dressing prevents it from escaping; it also indicates the exact location of the opening in the side of the tube. Between the walls of the incision and the tube, which should have stiff walls to prevent kinking or compression, strips of Iodoform gauze should be packed sufficiently tight to prevent hæmorrhage. A number of layers of sterile gauze, four inches square, with an opening the size of the tube in the middle, should be threaded over the tube and held against the perineum and safety pin by a crossed perineal bandage. After the patient has been placed in his bed the perineal tube must be connected by a piece of glass tubing with a rubber drainage tube, about one-third of an inch in diameter, which extends to the bottom of a receptacle containing eight ounces of an aqueous solution of Bichloride of mer-

cury, 1-2000. The end of the tube, to prevent possible ascending infection, must always be inserted in the solution.

The question of the retained catheter or perineal drainage by a rubber tube introduced into the bladder through the perineal wound has provoked much discussion. Some surgeons, as Moullin and Gerster, do not favor bladder drainage unless the urine is fœtid. They do not pack the perineal opening, but simply cover it with a sufficient quantity of Bichloride gauze and change it after each micturition or when it becomes soiled, the parts being douched and bathed with a warm 50 per cent. solution of Electrozone or Bichloride of mercury, 1-3000, before fresh dressings are applied.

The packing between the walls of the wound and drainage tube can be removed on the second or third day and not renewed unless bleeding is excessive. The tube may be removed on the fourth to sixth day unless excessive cystitis is present, in which case it may be necessary to leave it for ten days or two weeks. Sometimes, even when the tube is rightly located, it may, during the first twenty-four hours, cause spasm, requiring for relief its removal. Spasm, however, is more frequently due to a misplaced tube or to the bladder being over-distended with blood clots, etc. While the tube is in place the bladder must be douched daily with about a quart of a warm 10 per cent. aqueous solution of Borolyptol or Bichloride of mercury, 1-10,000. The internal administration of five grains of Boric acid, Salol or Urotropin, three times daily, very effectually combats urethral fever, though it sometimes occurs, when Norwood's tincture of *Veratrum viride*, *Populus*, *Aconite*, etc. will be indicated. On the fifth day after the removal of the perineal tube a steel sound should be passed through the urethra, and be repeated every week for three months and then once a month for at least a year.

When a deep stricture is complicated by a false passage, deep urethral vegetations, or when the roof as well as the floor

of the urethra is extensively involved, the perineal opening is extended upward along the perineum and the parts exposed, the pockets slit up, the vegetations removed by the curette, and if there are cicatrices on the roof they are longitudinally incised; perineal drainage is instituted as already outlined and a soft rubber tube about five millimeters in size, smaller than the normal urethra, passed through the meatus down the urethral to the perineal tube and tied in, and the tissues overlying the drainage tubes are brought into apposition with silk-worm gut. To insure good union they should not be tied until the patient is at least partly released from the lithotomy position in order to relax the perineal tissues. The urethral tube should be retained from four to six days and the peri-



Fig. 95.—Gouley Tunneled Catheter.

neal from seven to fourteen days. A sound about two sizes larger than the urethral tube should be introduced on the fourteenth day and its introduction thereafter repeated every week for two or more months, being gradually increased in size until a size corresponding to the Otis estimate is reached.

If a grooved urethral staff cannot be made to pass the stricture (its successful passage being evidenced by the ease with which the instrument can be removed), an attempt should be made to introduce a filiform guide. Over the filiform, as a guide, an attempt may be made to get a grooved tunneled catheter (Fig. 95) to enter the stricture; in many instances this is successful. Great caution must be observed in this maneuver as the injudicious application of even a small

amount of force will sometimes greatly damage the urethral wall. The Symes staff, which is sometimes useful in this operation is, in the author's opinion, objectionable on account of its sharp-pointed end, which, in the hands of those unaccustomed to its use, has been forced through the urethral wall and caused much damage. If the tunneled sound is successfully introduced, the stricture may be divided upon it on the same general lines as described for an external urethrotomy with a guide. If the tunneled sound will not enter the constriction it can be passed down to the stricture, held in position by an assistant, and the perineal incision made in the median line from before backward exposing the end of the sound in the urethra and the stricture behind it; the stricture should not be divided until the opening through which the

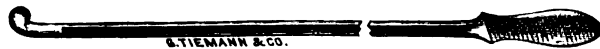


FIG. 96.—Wheelhouse Staff.

filiform passes has been sufficiently enlarged to allow a grooved director to be introduced and the operation completed as already outlined.

External Urethrotomy Without a Guide.—If a filiform will not enter the stricture, the tip of a grooved urethral staff may be pressed against the stricture and a sufficient vertical incision made in the median line of the perineum to expose the bridged portion of the instrument. The best staff for this was devised by and is known as the Wheelhouse (Fig. 96), which is not only grooved but has a little knob at the end. After the canal is incised, long loops of silk are introduced through the wound so as to include the edges of the divided urethra. Tension on the loop separates the divided canal and on turning the staff the knob can be hooked into the upper end of the wound, when by slight traction the urethra is opened and the parts exposed, and an Arnold's silver

probe (Fig. 97) may be introduced into the opening of the stricture.

To find the entrance of the strictured orifice of the urethra often requires much time and patience. When the aperture of a tight stricture is obscured by the presence of granulations, a probe pressed against it often passes through the opening. It is then easy to dissect away sufficient cicatricial tissue to permit



FIG. 97.—Arnold Grooved Silver Probe.

the introduction of a director. A false passage must not be mistaken for the urethral canal. When the guide leads into a sac of this character a little dissection upward will usually lead to the urethra imbedded in the cicatricial tissue. In explorations of this nature the incision must be confined to the scar tissue or unpleasant results may follow, particularly when the operator has lost his anatomical landmarks.

After the Arnold's probe has been introduced through the stricture the bands are thoroughly divided with a narrow probe-



FIG. 98.—Gouley Beaked Bistoury.

pointed bistoury (Fig. 98), permitting the Teale gorget to enter the bladder and the operation finished as already described.

Cock's Operation or Perineal Section has always been considered a formidable procedure on account of the skilful technique required for its successful accomplishment, being performed without other guide than the anatomical landmarks. It consists in tapping the urethra at the apex of the prostate posterior to the stricture. It is indicated in urinary retention with impassable stricture, provided there is only

slight or no urinary extravasation in the immediate neighborhood of the urethra, and gangrene is absent. A long slender-bladed knife is introduced into the lower median portion of the raphé of the perineum and, with the left forefinger in the rectum as a guide, the knife, with its cutting edge turned upward to prevent incision of the rectal wall, is directed so as to pierce the apex of the prostate and the floor of the bladder near the vesical neck or enter the expanded urethra of the prostate. When the distended bladder is reached and opened some urine usually flows out along the knife. A director is then introduced alongside of the knife, the latter is removed and a drainage tube inserted, which is allowed to remain and receive the usual care until the inflammatory condition has subsided and the stricture is relieved by dilatation or urethrotomy. Severe hæmorrhage and deep-seated urinary extravasation is liable to follow this operation.

Supra-pubic Cystotomy with Retrograde Catheterization.

—This has been considered by many as preferable to Cock's operation. It is to be thought of where entrance to the bladder cannot be effected in the usual way, particularly when there is extensive urinary infiltration, gangrene and abscess formation, or where, from the condition of the patient, time is an important consideration. The operation affords immediate and complete relief of the urinary retention and serves as a path of exit for deep-seated extravasations, prevents further infiltration behind the stricture, directs the urine from the perineum, is free from danger of hæmorrhage, and when the final operation for stricture is performed it permits of retrograde catheterization, location of the posterior border of the stricture and easy division of its contracting bands.

The technique of supra-pubic cystotomy is given under diseases of the bladder. Usually in about ten days or two weeks after drainage of the parts and resulting contraction of the

tissues, etc., or immediately when there is no urinary extravasation and a supra-pubic cystotomy for relief has been performed, a second operation becomes necessary. A Benique sound of proper size is introduced through the supra-pubic opening, engaged in the urethral exit of the bladder and carried forward until obstructed by the stricture, where it is maintained in position by an assistant. Then a sound is introduced along the anterior urethra, when by perineal section the strictured point between the sounds are easily divided. The after-treatment is the same as that already described.

Resection of the Urethra.—Resection of the urethra for an extensive cicatrix involving the canal following traumatism, extensive destruction of the parts from gangrene and abscess as well as from gonorrhœa, may be necessary. The strictured mass having been exposed by a perineal incision, it and the inclosed urethra are removed, the urethra being cut at an acute or an obtuse angle (never at a right angle on account of contraction and narrowing of the canal), leaving a soft natural tissue bed. A penile urethral tube and perineal drainage tube are then located, the perineal wound closed, and treatment instituted as described under external urethrotomy. A sound must not be introduced until three weeks after the operation. When the stricture does not involve the whole urethral wall the healthy part should not be disturbed. It is also well to increase the size of the obtuse angle of the urethra by extending, by longitudinal incision, its extent along the canal one-quarter to one-half inch. Some surgeons have attempted, with a varying degree of success, to remove the cicatricial tissue and graft mucous membrane to the surface to form a new urethra. This has sometimes been seemingly successful, but the method above described proves that the result was due to other causes than grafting.

The perineal line of union is dressed with Iodoform and plain sterilized gauze sufficient in quantity to absorb the

urine which may dribble from the wound. It must be **changed** as often as it becomes soiled. The bladder should be **washed** daily with a warm aqueous solution of Boric acid through the perineal tube. After the first dressing, the dressings are retained with the ordinary T-bandage.

Urinary extravasation when present must be treated by extensive and deep incision sufficient to reach to the lowest depths of all the tumefied parts. The infected area must be freely incised, all pockets opened up and all necrotic tissue cut away and free drainage instituted. When the extravasation has been excessive it may be necessary to carry the incision down the perineum to within one-half inch of the rectum and forward, splitting the scrotum, to the root of the penis. The anterior urethral strictures may be severed at this operation or at a later one. The after-treatment differs little from that advised for cases of external urethrotomy except that the infiltrated area must receive appropriate irrigation and drainage.

Urethral fistulæ may result from improperly treated urinary extravasation, which is the sequence of a urethral stricture, and connect the urethra behind the constriction with the surface of the body, or they may open into the rectum (urethro-rectal fistulæ). When not preceded by stricture of the urethra such fistulæ are generally traumatic or tubercular. Uncomplicated tubercular urethral fistulæ sometimes close if they are given free drainage, kept clean, and the general health is built up. The same is true of those resulting from urinary extravasation provided the urethral stricture is removed. When complicated by granulations or phosphatic concretions this extraneous material must be removed by the curette before reunion of the parts can be expected. Generally, however, a perineal section will be necessary and each fistula must be followed up and its pyogenic membrane entirely removed with the curved scissors. Unless this is thoroughly accom-

plished a secondary urinary leakage and the re-establishment of the urethral fistula may be expected. When possible, a filiform should be introduced through each fistula to the urethra ; if they are numerous it is best to perform an extensive section of the perineal tissues and expose the urethra, which is then over-distended with sterilized milk, each point of leakage located, a filiform probe introduced, the entire false pyogenic membrane removed and the operation completed with the usual drainage as in external urethrotomy. In the tubercular variety, especially when insufficient cicatricial tissue has been removed, they often fail to unite.

In the various varieties of external urethrotomies, uræmia is, if the kidneys are normal, of rare occurrence. To guard against it, large quantities of bland water should be taken for twenty-four hours previous to and for some days after the operation. If for any reason after a surgical operation upon the genitalia the urinary secretion falls below thirty ounces per day the administration of a diuretic will frequently be necessary.

The bowels must always be properly regulated, either by *Cascara sagrada* or a saline cathartic. Hæmorrhage is uncommon if the prostate is not injured, though it may be due to injury of the erectile tissues of the bulb. It is generally easily controlled by packing gauze around the drainage tube. Hæmorrhage may be secondary, sometimes appearing on the fourth to the fourteenth day. After the tenth day it is rare. This bleeding sometimes is alarming and may be fatal. It can be controlled by packing the wound with sterile gauze, by perineal pressure and by the injection of an aqueous solution of Adrenal chloride. Septic conditions sometimes develop, especially after the removal of the perineal tube and the first urethral instrumentation. They may be minimized or prevented by the administration of Urotropin or some other internal urinary antiseptic. The temperature may rise

to 105° to 107° Fahr., but is generally controlled by Norwood's tincture of *Veratrum viride*, or Quinine sulphate.

The perineal wound generally heals in four to six weeks unless, on account of some severe bladder, prostatic or kidney disease, drainage has been long-continued. In tubercular subjects it may never heal, or having closed, without reasonable cause, it may reopen, though sometimes it finally closes permanently. Patients are generally up and around the room by the end of the second week and it is not uncommon for the perineal opening to be entirely closed by the sixteenth day after operation.

False Passages.—If the patient is able to void his urine, a false passage, due to some urethral instrument, may be left to nature, and a good internal urinary antiseptic, such as Urotropin, Cystogen or Boric acid. When due to accident during urethral instrumentation, there is usually slight bleeding for one or two days, which is followed by a slight purulent discharge. The false passage usually closes in about two weeks. A pus-producing cavity, abscess and urinary infiltration with urethral fever may, however, follow puncture of the urethral wall. The treatment and how to avoid old false passages in the introduction of urethral instruments has already been given.

FOREIGN SUBSTANCES IN THE URETHRA.

Foreign Bodies in the Urethra.—From either end of the urethra varied substances may enter and become lodged; others originate in or around the urethra. They may be introduced into the urethra accidentally during instrumentation by the breaking of an instrument, or intentionally by the foolish, curious or insane. The objects which have been introduced include pieces of wood, nails, slate pencils, needles, pieces of glass, hair pins, toy whips, seeds, etc. The tendency of all smooth bodies within the urethral canal is to travel backwards

to the bladder. The symptoms indicating the presence of a foreign body in the urethra are pain, shooting into the perineum, down the thighs or over the abdomen, and frequent and unsatisfactory micturition. Later, there is a sero-sanguinous discharge from the urethra; the penis becomes swollen, œdematous and painful. If not removed an abscess may result.

Treatment.—Over-distension of the urethra by closure of the meatus during micturition, followed by the sudden forcible expulsion of the urine, is sometimes successful in expelling a foreign body. If the obstructing mass is in the anterior urethra, the alligator urethral forceps, a probe with its end bent to an acute angle or with a screw end, to penetrate the foreign material, may be used to advantage. If the extraneous body be long and soft, *e. g.*, a piece of catheter or wood, it may be transfixed through the wall of the canal with a stout needle and pushed back like a finger in a glove until it makes its appearance at the meatus. Pins and needles may be pushed through the floor of the urethra, where they can be easily removed. In the case of a hat-pin, the point may be thrust through the urethral wall and, after being drawn out, the shaft can be turned so that the head of the pin can be pushed out through the meatus. In all manipulations of this character an assistant should, by pressure upon the urethra behind the obstructing mass, prevent it slipping back into the bladder, which would necessitate a cystotomy for its removal. If a foreign body becomes lodged behind a stricture, the urethral narrowing should be incised or rapidly dilated before attempting to remove the substance from the urethra. These methods being unsuccessful, incision along the axis of the urethra over the extraneous mass and its removal, with continuous bladder drainage for about four days, may be necessary.

Urethral Calculi.—Calculi may form in the urethra or become lodged there while escaping in the urinary stream from

the bladder. On escaping, the calculus usually finds lodgment in either the membranous or navicular portion of the urethra, or behind a stricture. When the calculus is of vesical origin the onset of the symptoms occurs suddenly during urination, the flow of urine stopping with accompanying pain. If the canal is of sufficient size and the force of urine behind the calculus be adequate, it will be expelled; if not, it may become firmly impacted.

When the calculus is small and irregular it may be caught in the membranous urethra and cause vesical tenesmus, pain, and a bloody urethral discharge, which appears especially at the end of micturition. When of large size, it may produce retention of urine. If small, it may, by irritation, induce urethral congestion, spasm and urinary retention. If smooth, it may be caught in its exit either in the narrowing at the meatus or of a stricture, at first producing only a few symptoms, the urine flowing around it. Later, it may completely close the canal or become of considerable size and produce local ulceration. When the calculus forms in the urethral canal it produces a slight gleet discharge and later some urinary obstruction, ulceration, etc. Peri-urethral calculi may remain unrecognized until they come to the surface. A calculus in the urethra can be generally located by palpation through the urethral walls and the discovery confirmed by the grating sound as a steel sound is introduced. The clinical history of previous renal colic may greatly assist in the diagnosis.

Treatment.—When the calculus is located in the fossa navicularis or behind a stricture it can generally be successfully removed, after division of the obstructing tissues, by distending the urethra with olive oil and applying pressure from behind forward. If it is located in the membranous urethra, removal through a perineal section is usually necessary. This procedure is sometimes advisable when the calculus is located behind a stricture. When the calculus is lodged in the deep

urethra it may for relief be advisable to force it back into the bladder by the introduction of a full-sized steel sound.

URETHRAL GROWTHS.

Urethral Papillomata (Fig. 99) cause few clinical manifestations and rarely become transformed into fibromata. They may be suspected when symptoms of urethral stricture are present and slight bleeding follows the introduction of a full-

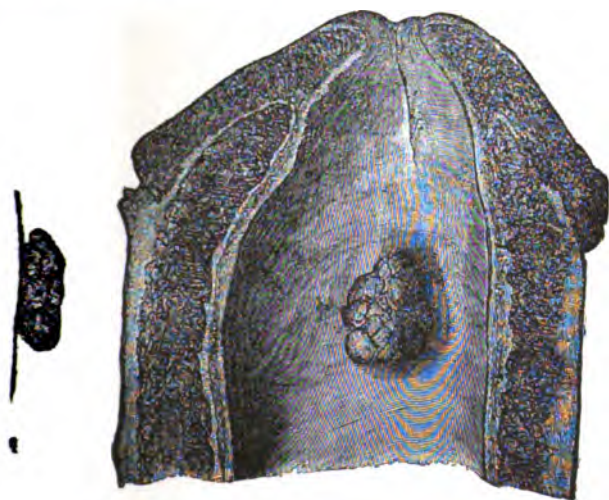


FIG. 99.—Papilloma of the Urethra. (Voillemier.)

sized sound. Mucous polypi sometimes exist in the urethra. They are generally small and may be sessile or pedunculated. They may appear in any part of the urethra, but are usually located in the fossa navicularis. Generally they are the sequella of a chronic urethral lesion.

Treatment.—If the growth is situated in the anterior urethra the canal should be anæsthetized, a full-sized Klots endoscopic tube introduced, and the growth removed by friction between two cotton tampons tightly applied to alumi-

num applicators placed one behind and one in front of the warty mass. The friction is usually accompanied by quite a profuse hæmorrhage. A soothing urethral injection should be used for some days after the operation; if the growths return the operation should be repeated in a week or ten days. Mucous polypi can be removed through the urethroscope with the Gruenfeld snare (Fig. 100) or forceps, curetted off, though it may be necessary to repeat the operation a number of times, or cauterized with Nitrate of silver. Growths located in the deep urethra must be removed through a perineal incision, with after-treatment as in urethral rupture.

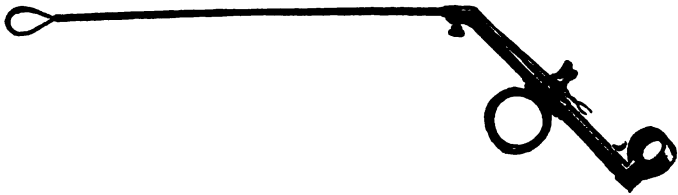


FIG. 100.—Gruenfeld Urethral Polypus Snare.

Cysts of the Urethra sometimes occur and cause symptoms of obstruction, varying with their size.

Carcinoma of the Urethra.—Unless the growth is due to extension from the prostate, the bladder or the penis, it is extremely rare. When primary, it generally develops in a patch of old scar tissue of gonorrhœal origin located in the bulbous region of an elderly subject. If discovered late, when by its presence it is producing urinary obstruction, external urethrotomy and bladder drainage may give relief. When diagnosed early the diseased parts and testes should be removed and the urethral orifice located in the perineum as directed under the operation for complete extirpation of the penis.

SECTION X.

ASSOCIATED LESIONS AND EXTRA GENITAL DISEASES OF GONORRHOEAL URETHRITIS.

These complications may be due to a direct extension of the inflammatory lesion in the urethra ; they also include numerous morbid conditions in other mucous membranes and structures of the body caused by the gonococcus of Neisser. Individual idiosyncrasies have much to do with their development, though they usually owe their origin to injudicious treatment or some ill-advised excess or exercise. The most important associated complications, such as inflammatory phymosis, epididymitis, prostatitis, spermato-cystitis, lymphangitis, inflammatory adenitis, etc., have received consideration in other portions of this book. For want of space the gonorrhœal affections of the eye have been omitted.

Folliculitis.—This term signifies an inflammation of one or more of the urethral follicles. It is due to extension of the specific disease of the mucous membrane of the urethra to the sinus of Morgagni or the urethral follicles, resulting in a retention cyst. It may complicate an acute urethritis and not infrequently it occurs during a sub-acute or chronic attack. It sometimes arises from inflammatory conditions existing behind a stricture. Folliculitis is usually excited by some alcoholic or sexual excess, direct violence, strong urethral injections or rough instrumentation.

Clinical History.—A varying degree of local pain directs the attention to the parts, where on palpation a sensitive hard shot-like body beneath the skin will be discovered. At

first it is not adherent to the overlying skin, and as a rule is not particularly tender. On manipulation it appears to have a little fibrous-like string attaching it to the urethral mucous membrane. This is the obliterated duct of the diseased gland. These follicular tumors vary in size from a pin-head to a pea. They may resolve, but, if pus forms, a route for its escape will open by ulceration either towards the urethral surface or into the peri-urethral tissues and terminate in a peri-urethral abscess. When it discharges into the urethra the sac frequently fails to close and continues as a suppurating pouch, which at times refills and empties into the urethra. It is often the source of a chronic gleet. Sometimes the pus burrows both ways and a urethral fistula results.

Treatment.—During the early part of the inflammation, rest, elevation of the parts, and the application of mild Carbolic acid stoups covered and protected with gutta-percha tissue will be efficacious. Incision of the retention sac should not be made until fluctuation is manifest, when it should be made from within outward through the urethral mucous membrane. The sac is exposed to view by means of the Tilden-Brown wire urethral speculum and punctured with a urethral knife. If the sac does not rapidly close and unhealthy granulations develop they should be destroyed and resolution facilitated by injecting into the follicular cavity a few drops of Pyrozone of 3 per cent. strength, using a fine drawn glass pipette with bent extremity and rubber cap. It may be necessary to apply a 5 per cent. solution of Pyrozone or Nitrate of silver, every one to three days for some time thereafter, to cause complete obliteration of the abscess cavity. When the malady is of the more chronic variety, and the inflamed follicles do not suppurate, they should be removed through a cutaneous incision, the duct of the follicle being sufficiently occluded to prevent the escape of urine from the urethra. The wound may be expected to heal like a simple incision.

Peri-Urethral Abscess.—This condition may originate apparently spontaneously, be the result of the burrowing of pus from a follicular or lacunar suppuration which has ruptured and extended beyond the bounds of its sac, or a minute break in the urethral mucous membrane with resulting peri-urethral infection. Its most common location is at either side of the frenum—constituting a sub-frenal abscess—about two inches posterior to the meatus or in the perineum. With the development of a peri-urethral abscess there is a varying degree of inflammatory reaction. The phlegmonous mass is painful, sensitive and may rapidly increase in size, sometimes encroaching upon the urethra sufficiently to produce urinary retention, or distort to a varying degree the conformation of the penis. If the pus is not liberated by surgical measures it may open into the urethra, burrow through its cutaneous covering and open upon the surface, or burrow extensively through the neighboring sub-cutaneous tissues.

Treatment.—As soon as fluctuation is manifest a proper incision through the walls of the pus cavity should be made for the evacuation of the purulent material and the treatment of the cavity on general surgical principles.

Cowperitis.—**Etiology.**—This disease rarely occurs excepting during the course of a urethral inflammation. It frequently appears during the third or fourth week of a gonorrhoeal invasion. It may happen at any time during a chronic anterior urethritis; usually it follows some urethral instrumentation or excessive sexual indulgence. It may arise apparently *de novo*, though, when not of gonorrhoeal origin, it usually can be traced to horseback riding, dancing, wheeling, etc.

Clinical History.—Generally only one gland is involved and by preference the left. It produces a sense of uneasiness and discomfort in the perineum, which, in itself, when the inflammation is slight, does not differ from the reflex pain of disease of the urethra or prostate. When the patient is placed

in the lithotomy position and the perineum palpated, a point of sensitiveness will be present at the side of the median raphé, though no inflammatory induration may be recognized. The early or congested stage is passed in a few days and terminates either in recovery or suppuration. If the inflammation does not subside, a small body about the size of a pea develops in the perineum at the side of the median raphé, which is somewhat movable beneath the skin and extends from the bulb backward, terminating just in front of the anus in a blunt end, its longest diameter being parallel with the perineal raphé. Suppuration generally occurs in ten to twelve days, during which time the tender hard mass gradually increases in size, the perineal integument covering it becoming inflamed and adherent. Sitting, walking, standing and pressure of the clothing increase the local pain. Urination becomes painful, difficult, and urinary retention may happen. The small abscess may discharge itself through Cowper's duct, the disease terminating in resolution or in a chronic suppurating pouch, producing a chronic gleety discharge which contains cuboidal and cylindrical epithelia, mucus, pus, bacteria and often gonococci. The urethral discharge may only be present in the morning, perineal examination revealing only a slightly sensitive indurated area corresponding to the gland of Cowper, and the urethroscope an inflamed opening of its duct. It is not uncommon for the pus sac to have one exit through the duct into the urethra, and another through the skin, producing a urethral fistula, though, from the natural position of the duct, no urine escapes during the act of micturition.

Peri-Cowperitis.—When an abscess forms within the gland of Cowper and discharges itself through the skin or burrows into the neighboring parts, it is always accompanied by a varying degree of inflammatory peri-Cowperitis, either as thickened tissue around the inflamed gland or a chronic suppurating inflammation.

Prognosis.—Cowperitis may go on to suppuration, though it often resolves spontaneously. When an abscess forms and is surgically opened, recovery without difficulty or delay may be anticipated. When it is allowed to discharge itself spontaneously a fistulous termination may be expected, in which the lesion is liable to continue indefinitely unless surgical attention is given and all the diseased parts are freely removed.

Treatment.—In the early period absolute rest in bed with hot sitz baths and poultices are essential and efficacious. The inflamed gland should never be incised until fluctuation is distinctly manifest, as it sometimes discharges itself unexpectedly through the occluded duct of Cowper. When it becomes necessary to evacuate the pus a liberal incision must be made to drain the pus cavity and to allow curretting, if necessary, of the various ramifications of the glands. After it is surgically cleansed with a 30 per cent. solution of Electrozone, the abscess cavity should be tightly packed with Iodoform gauze which should be re-applied every second day to insure closure from the bottom and prevent a urinary fistula. In the early stage Aconite, *Cannabis sativa*, *Sabal serrulata* or *Mercurius corrosivus* will often abort the process. In the event of suppuration *Hepar sulphur* or *Silicea* will facilitate recovery.

Gonorrhœal Pyelitis.—This condition of the kidney structure is probably due to an ascending infection by the way of the ureters, though it may occur through the lymphatic connections without involvement of the ureters. It may happen during an acute gonorrhœa and be slight or severe in character. Its clinical history and treatment do not differ from general suppurative pyonephrosis. The remedies which have given the most satisfaction in its treatment are Urotropin, Helmatol, Diatheron and Echinacea.

Ano-Rectal Gonorrhœa.—This complication may arise from natural conditions or uncleanly habits in the female or be due to the acts of sodomy.

Clinical History.—The time of appearance and the period of incubation depends largely upon the exciting cause. The rectum and anus become swollen, accompanied with considerable local burning, smarting and itching with a varying amount of muco-purulent discharge which contains gonococci. Sometimes the mucous membrane becomes excoriated and the sphincter relaxed. The act of defecation may be normal or painful. If the local condition is not subjected to proper treatment the natural folds about the anus become swollen, excoriated, fissured and watery.

Treatment.—Cleanliness is of the first importance. Hot saline sitz baths are soothing and beneficial. Hot rectal injections of Permanganate of potash, 1-10,000 to 1-5,000, Sulpho-carbolate of zinc, 1-2,000, Bichloride of mercury, 1-10,000, Nitrate of silver, 1-20,000, or a saturated solution of Boric acid, two or three times a day, followed by the injection and retention in the rectum of one ounce of a warm 2 per cent. solution of Argyrol, are very efficacious. These local measures together with the remedy necessary for the totality of the symptoms presented will prove successful, though it may be necessary to continue the treatment for some time. The rectal fissures and ulcerations may be benefited by an occasional local application of Nitrate of silver, sixty grains to the ounce, or a saturated solution of Iodine crystals and Beechwood creosote.

Buccal Gonorrhœa.—Cases of this class have been reported, as well as gonorrhœa of the nose. Should the condition be verified by bacteriological investigation, local and germicidal treatment must be depended upon to cure.

Gonorrhœal Arthritis.—**Etiology.**—This so-called rheumatism is not of infrequent occurrence in young men whose constitutions are somewhat enfeebled either by excesses or overwork, or where there is an individual predisposition. It is due to the appearance in the involved tissues of the gonococcus

or its toxine which enters by the way of the circulation. Females are rarely affected, though a condition somewhat similar often occurs in women suffering from chronic endometritis of possibly gonorrhœal origin. It has occurred in newborn infants following gonorrhœal ophthalmia. It is a systemic gonorrhœal infection. It is supposed by many to be a slight form of pyæmia, which depends upon individual idiosyncrasy, as it is an exceptional complication and not the rule of gonorrhœa. It is not dependent upon atmospheric conditions, overexertion, etc.

Clinical History.—The disease appears in from six to eighteen days after the appearance of the gonorrhœal urethritis, rarely before the fifth day or after the second or third month, and never until the deep urethra is involved; until the disease disappears from the urethra, gonorrhœal arthritis, in those who are susceptible, is liable to occur. When it develops early it has no appreciable effect on the urethral discharge, but later it has been noticed that it increases somewhat for a day or two preceding the arthritic outbreak, the exacerbation of the discharge probably being the exciting cause of the general lesions. Gonorrhœal arthritis resembles rheumatic gout. It appears in many forms, but has many characteristic individualities. It attacks by preference the knee, ankle, or sterno-clavicular articulations and finally the joints in the foot and hand. In the latter, the synovial sheaths of the tendons and muscles as well as the bursæ are liable to be invaded. The sheaths of the nerves, the meninges of the brain and cord, the pleura and pericardium may be involved. The bursa between the tendo-Achilles and the os-calcis is frequently attacked, becoming distended with a watery fluid, thus giving rise to the pain in the heel on walking so often complained of by the gonorrhœal patient.

Gonorrhœal arthritis or rheumatism frequently manifests itself as a mono-articular disease, usually selecting the knee-

joint, sometimes the ankle, elbow or wrist, which becomes occasionally greatly distended with fluid (hydrothrosis), accompanied by uneasiness and want of confidence in the joint, together with, if long continued, weakness and atrophy of the muscles of the thigh and leg; pain is rarely present, or, if in evidence, it is always of slight degree and increased by motion. The swelling is not accompanied by redness of the parts or constitutional symptoms.

In the poly-articular form several joints are attacked one after the other, but those first involved continue to suffer during the attack and are the last to recover. In the poly-articular form, which resembles acute articular rheumatism, the joints are somewhat swollen and red accompanied with some fever, which is always less than in acute articular rheumatism, often lasting but a day or two. The tendons connected with the joints are generally involved and feel like thick bands; the conjunctivæ become red and congested, the conjunctivitis frequently preceding the rheumatic symptoms. Entire lack of proportion between the local and constitutional symptoms is characteristic. Pain is usually mild, though it may be severe. Perspiration, which is profuse in acute articular rheumatism, is generally absent in gonorrhœal arthritis. It may, however, be profuse and exhausting, but it occurs only at night. There is no change in the urine. The concentrated acid urine of acute articular rheumatism is absent. The disease is tedious, frequently lasting for months; recurrent attacks may lead to ankylosis. Occasionally the joint contains considerable purulent fluid. The inflammatory condition does not move from joint to joint, and is rarely complicated with cardiac lesions. Arthritis occurring during a gonorrhœa urethritis predisposes to a return of the rheumatic symptoms with each subsequent attack or exacerbation.

There is also an ambulatory form in which there is no apparent local lesion of the joints, yet persistent pain is present,

which increases and decreases in severity, with the local lesion in the posterior urethra. The synovial sheaths of the muscles may be alone involved, as well as when connected with the joint disease, producing tumefaction along the course of the tendon, pain on motion or manipulation, and redness of the overlying integument. The conditions are all relieved by rest, but the joints remain stiff long after the acute symptoms have disappeared.

The differential diagnosis points between gonorrhoeal arthritis and simple rheumatism are well stated by Fournier, as follows:

GONORRHOEAL ARTHRITIS.

1. Cause: Gonorrhoea. No influence of cold in the production of the rheumatism.

2. Very rarely observed in women.

3. Non-febrile, or much less so than simple rheumatism. Even in acute cases reaction never attains the habitual intensity of rheumatic fever.

4. Symptoms habitually limited to a small number of joints. The affection never becomes general to the same extent as does simple rheumatism.

5. Less movable than simple rheumatism, going from one joint to another less quickly. No delitescence; no real jumping from one joint to another.

6. Local pains generally moderate, always less than in simple rheumatism, sometimes remarkably indolent.

7. Frequently a tendency to hydrothrosis following the acute flexion.

SIMPLE RHEUMATISM.

1. No etiological relation with the state of the urethra. Habitual causes: Cold, inheritance, rheumatic diathesis, etc.

2. Common in the female, although less frequent than in the male.

3. Reactional phenomena much more intense and prolonged than in gonorrhoeal rheumatism.

4. Symptoms usually involve a number of articulations, sometimes nearly all of them.

5. Symptoms: Movable, ambulatory flexions; rapid delitescence, jumping from one joint to another.

6. Pains always rather intense, sometimes excessive, disappearing less rapidly than those of gonorrhoeal rheumatism.

7. Little or no tendency to consecutive hydrothrosis.

GONORRHOEAL ARTHRITIS.

8. No sweating.
9. Urine not modified.
10. Blood not furnishing a marked buffy coat.
11. Cardiac complications very exceptional.
12. Frequent coincidence with a special ophthalmia, inflammation of the synovial sheaths of the tendons, inflammation of the bursæ, etc. The latter localities may be exclusively implicated.
13. Relapse in the course of successive gonorrhœas very frequent.

SIMPLE RHEUMATISM.

8. Abundant sweats, constituting a symptom almost essential to the malady.
9. Urine specially modified.
10. Blood forming a firm, concave clot with a buffy coat.
11. Cardiac complications frequent.
12. Acute rheumatism does not affect the eye; the bursæ escape, as do usually the sheaths of the tendons.
13. Relapse frequent, but always independent of the state of the urethra.

Treatment.—Traditional medicine acknowledges that the internal medication beneficial in ordinary rheumatism has proven useless in gonorrhœal arthritis. While it is true that the gonorrhœal arthritis may cease before the urethral condition is cured it is a fact that the more quickly the urethral discharge is controlled and the gonococci eradicated, the more readily the arthritic lesions can be controlled. Rest in bed with a light or restricted diet during the acute phenomena is important. The inflamed joints in the poly-articular class should, until the acute symptoms subside, be rubbed frequently with pure Salicylate of methyl, wrapped in hot moist flannels and covered with gutta percha tissue. Others do well when covered with pure Ichthyol or Antiphlogistine. In the sub-acute variety the best results are obtained by the daily application of a roller rubber bandage to the toes or fingers and the limb to a point six inches above the involved joint. The bandage is kept on from ten to thirty minutes, depending upon the ability of the patient to stand the pain. This treatment with the indicated remedy has proven ex-

trremely satisfactory and successful during its five years' use at the Metropolitan Hospital.

When chronic hydroarthrosis is established it may be necessary to resort to surgical relief. The same is true when a complicating pyogenic infection occurs. Arthrotomy and irrigation of the joint with a solution of Bichloride of mercury, 1-5,000 to 1-1,000, is often very efficacious. The joint being punctured with two good sized trocars, is irrigated with a hot normal saline solution, and finally with about two quarts of a Bichloride of mercury solution of selected strength, after which the joints must be put under moderate pressure by properly applied bandages with or without drainage. Later blisters and the cautery may be necessary. The thickening and induration of the muscles and tendons is sometimes relieved by massage, hot and cold douches, electricity and Turkish baths.

The remedies with their indications which are most frequently necessary are :

Aconite.—Required in the first forty-eight hours of the disease. Febrile state ; large joints involved ; hot and swollen, with shooting, cutting pains ; anguish ; thirst ; restlessness ; painful sensitiveness, does not want to be touched.

Apis mellifica.—Mono-articular form. Joints distended with fluid ; pale ; often some fluctuation and a stretched, tight feeling ; burning, stinging, sticking pains ; worse on motion ; parts very stiff ; exceedingly sore to any pressure, with sensation of numbness.

Arnica.—Useful in the mono- and poly-articular inflammations. General bruised feeling ; aggravation from motion or touch in the evening and night ; stiffness in the large joints ; hydroma patellæ ; white swelling of the knee ; sensation of soreness in leg.

Bryonia.—Indicated in the poly-articular variety. Sharp pain with feeling of tension, aggravated by motion and touch ;

relieved by moderate pressure, rest and warmth. Acts especially on the knee and ankle joints, which are hot, swollen, with a bruised feeling; inflammation of the joints more marked than the fever would indicate; joints very stiff with pain, as if sprained; pale swelling of the joints, with inability to move them; streaks of redness extend up and down the limbs from the joints; thirst for large quantities of water.

Causticum.—Later stages. Contraction and stiffness of the tendons, especially marked in the heel and tendo-Achilles; stitching, tearing pains; weakness, trembling, heaviness and prostration.

Cimicifuga.—Pain in joints without appreciable lesion; wandering pains; hysterical hyperæsthesia of rheumatic character.

Clematis.—Earlier stage. Pains aggravated by motion; general weakness; rheumatic pains, with thickening of joints in the hands and fingers.

Copaiva.—This remedy has frequently cured when the knees alone are involved.

Guaiacum.—Poly-articular form; declining stage; contraction and stiffness of the muscles and tendons, frequently with swelling of the joints; tearing pains; rigidity of joints, which are hot and swollen; they dread to move the limbs, which become thin and emaciated.

Kali hydriodicum.—Tearing and sticking pains in the joints, especially at night; stiffness of the joints.

Kalmia.—Sticking, shooting, darting, tearing pains, aggravated by motion and in the evening; bruised feeling; no swelling, no fever, but great weakness. Rheumatism of the soles of the feet.

Mercurius.—Tearing pains, worse at night, with or without swelling; joints puffy, of a pinkish-red color; pains increased by warmth.

Natrum sulphuricum.—According to Grauvogl this remedy is very often called for.

Phytolacca.—Feels sore and stiff from head to foot; chronic stiffness and swelling, with loss of motion; useful when the fibrous coverings of the joints and tendons of the muscles are involved.

Pulsatilla.—Mono- and poly-articular rheumatism; fugitive pains in various parts of the body; lymphatic temperament; drawing, tensive pains, with swelling and heat in the ankle and knee joints; soft white swelling of the knee.

Rhus toxicodendron.—Declining stage; acts especially on the sheaths of muscles and tendons. Bruised and sprained feeling in the large joints, relieved by continued motion and followed by weakness and stiffness of the joints; lameness, stiffness and great weakness; pains worse at night.

Sulphur.—A general alterative. The parts are stiff and lame; tearing and drawing pains in the joints, etc.

SECTION XI.

CYSTOSCOPY, URETERO-CATHETERIZATION AND URINARY SEGREGATION.

The possibility of ocular examination of the bladder through the urethra was first practically demonstrated, in 1879, by Nitze. Since then variously modified cystoscopes have been presented, by means of which the interior of the bladder not only can be viewed but the cavity irrigated, small growths removed and the ureters catheterized.

The ordinary cystoscope has a shaft varying from ten to eleven inches in length and from twenty-two to twenty-five millimeters in circumference. It terminates in a beak about three-fourths of an inch long, which joins the shaft at an angle of 145 degrees and is supplied with an incandescent lamp and window. The optical apparatus is placed in the shaft. A small section of the bladder surface is reflected through the window in the shaft near the beak upon the hypotenuse of a right-angled prism which in turn reflects it to two plano-convex lenses. These right the inverted image and focus it at the ocular end of the shaft, where it is magnified by a lens in the eye piece. A little knob on the top of the rim of the eye piece always shows the direction of the beak. For general use the Fenwick-Leiter cystoscope (Fig. 101), which has a handle to steady it, is satisfactory.

Cystoscopy can be conducted under general anæsthesia or the local influence of Cocaine or Eucaine. Local anæsthesia is affected as follows: Thirty minutes previous to the examination, one ounce of sterile water containing twenty grains

of Antipyrine and ten drops of Opium tincture is injected into the empty bladder. Immediately before introducing the cystoscope a one-grain tablet of Cocaine is deposited in the prostatic urethra, using the Bransford Lewis urethral tablet depositor, allowed to soften into a semi-liquid mass which is smeared over the mucous membrane of the urethra by moving the instrument backward and forward. It may be necessary to use two and sometimes three tablets to produce complete anæsthesia of the posterior urethra and the neck of the bladder; or one ounce of a 4 per cent. solution of Cocaine may be injected slowly into the urethra, the surplus passing into the bladder. Eucaïne may be used in the same manner.



FIG. 101.—Fenwick-Leiter Cystoscope.

All the antiseptic precautions usual in urethral instrumentation must be observed and the patient placed in the lithotomy position. If the bladder contains pus, blood, etc., this must be removed by douching the vesical cavity through a catheter, with a warm 3 per cent. aqueous solution of Boric acid until the returning fluid is clear, when from four to five ounces of the solution is injected and allowed to remain. If the urine is clear and sterile, douching will not be necessary. For satisfactory results in cystoscopic examination, the bladder must contain from four to five ounces of clear fluid.

Before introduction, the cystoscope should be immersed for a few minutes in a cool 3 per cent. aqueous solution of Boric acid and the illuminating power tested by turning on the electric current which is supplied by a small storage battery and controlled by a rheostat. After the instrument has been used it should be cleansed with soap and warm water, douched with Alcohol and sterilized in Formaline vapor, never being sterilized by boiling or steaming.

The cystoscope should be lubricated with Lubrichrondin and introduced with the same technique and extreme gentleness requisite in every urethral instrumentation. When the beak enters the bladder, if the latter is properly expanded, either naturally or artificially, all resistance will cease, and the instrument can be easily rotated. The introduction should then be continued until the beak lies approximately in the middle of the vesical cavity, the electric current turned on and the interior of the bladder illuminated.

The surface of the interior of a normal bladder, containing four or more ounces of clear fluid, when examined through the cystoscope, is straw-pink in color, curved, smooth or slightly trabeculated and presents numerous tortuous vessels. If, during examination, which can, when properly conducted, be continued for an hour or more, the fluid in the bladder becomes clouded by blood, pus, etc., the image will be obscured and the study will have to be discontinued. Depression and half rotation of the beak brings into view the base of the bladder and the trigone, at the outer posterior angles of which are the vesical openings of the ureters; these at intervals of thirty to sixty seconds, emit little jets of urine, the ejections not being synchronous or occurring at fixed intervals. The flow of urine may be increased by the ingestion of one or two glasses of Cartreville water an hour before the proposed catheterization. Sometimes blood or pus can be distinctly seen as it flows from the ureters. The location of the

ureteral openings may be marked by slight elevations, slits or furrows. Sometimes, especially when the bladder is not properly distended, their locations cannot be determined. Occasionally they are very prominent.

While much practice is necessary to recognize and not to be misled by the picture presented, yet ulcerations, cicatrices, infiltrations, growths, pouches, foreign bodies, calculi, etc., can generally be diagnosed and very good estimates formed of their character.

Ureteral Catheterization.—Lewis summarizes the purposes of ureter-catheterization in connection with the cystoscope for diagnosis and treatment as follows: To locate the origin of pus, blood, tubercular products or bacilli, the various pyogenic infections, abnormally desquamated epithelium, etc., as to whether they come from the bladder, the right or left ureter, the right or left kidney, the right or left peri-renal space and communicating with the corresponding kidney or ureter. To recognize and locate obstructive conditions in the right or left ureter from stricture, stone, adjacent tumors, bend or kink in the ureter from movable or dislocated kidney, valvular junction of ureter and its pelvis. To determine the presence of two kidneys; if only one, which one is absent; the number of ureters present; the functional activity of each kidney separately and relatively with respect to its excretion of urea, albumen, quantity of urine, the specific gravity, etc.; the size and capacity of each kidney pelvis with respect to hydronephrosis, pyonephrosis, total obliteration of kidney-secreting tissue, etc. If there be kidney disease present, to determine if only one kidney is affected or both; if only one, which is the affected one; if both, which is the one more affected; if removal of the worse one be advisable, is the other one able to carry on kidney function sufficiently? If removal of one be advisable, and the other is capable of supporting life, will the operation remove the infection from the

body, removing the possibility of dissemination or **recontamination**? To enlarge narrowings or stricture at the ureter openings or the channel of the ureters. By **facilitating** drainage through the increased ureter calibre thus obtained, to assist in the improvement of pyelitis, or pyo-nephrosis, **unilateral** or **bilateral**. To irrigate and medicate the ureters; the kidney pelves of one or both sides. To assist, by **anæsthetizing** and enlarging the ureter opening, the passage through it of a calculus or a plug of pus, blood, etc. To use the ureter, after it is catheterized, as a guide in certain abdominal and pelvic operations. By prolonged catheterization of a ureter to assist in the cure of urethral fistula.

Of the foreign instruments for catheterization of the ureters the Caspar is the best and most satisfactory. It is arranged so that after the ureteral openings are discovered, the catheters lodged in the instrument can be made to emerge and by pressure on the stylet diverted to any selected angle of direction facilitating their entrance into the vesical opening of the ureter.

With the ureter-catheter-cystoscope the examiner is generally able to introduce a catheter into the vesical opening of the ureter with but little discomfort and practically no danger. America has produced two instruments of this class, which are not only of simple construction but have a much wider range of usefulness than the European instruments. When the Tilden Brown ureter-cystoscope is employed, the vesical cavity is usually distended with a warm aqueous solution of Boric acid. With the Bransford-Lewis instrument the bladder is generally distended with air.

The Tilden Brown instrument for synchronous ureter-catheterization (Fig. 102) is composed of a common sheath with its obturator and a catheterizing telescope. The common sheath of the instrument performs the light carrying and irrigating requirements for the different telescopic tubes, the

lamp being of the non-hooded variety. When once within the bladder interchange from one telescope to another, such as an application or operating telescope, a prismatic double catheter telescope or one which looks backward is painlessly and quickly performed. The catheterizing telescope has a somewhat cylindrical form, the telescope being above, on the under surface of which are attached the catheter carrying canals which terminate in an oblique angle about one-sixteenth of an inch anterior to the end of the telescope; when inserted in the common sheath, it leaves two triangular crevices between the telescopic tube,

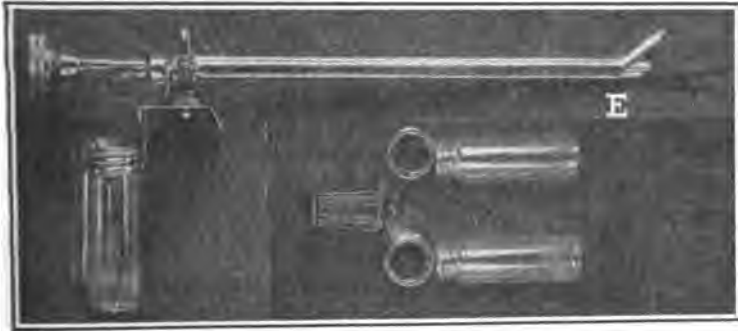


FIG. 102.—Tilden Brown Catheterizing Cystoscope Showing the Prow-like Distal End of the Catheterization Telescope and at the Proximal End the Catheters in the Receiving Bottles.

the two catheter tubes and the common sheath which forms the irrigating canals of the instrument, the openings to which are the two stop cocks on either side of the optical end of the common sheath. Through these canals the bladder can be irrigated, or, when advisable, they can be utilized to distend the vesical cavity with air. The quality and arrangement of the lens is responsible for the clear visual field while the excellent illumination is due largely to the

proximity of the lens and lamp. This object accounts for the prow-like protrusion of the different telescopic tubes. The

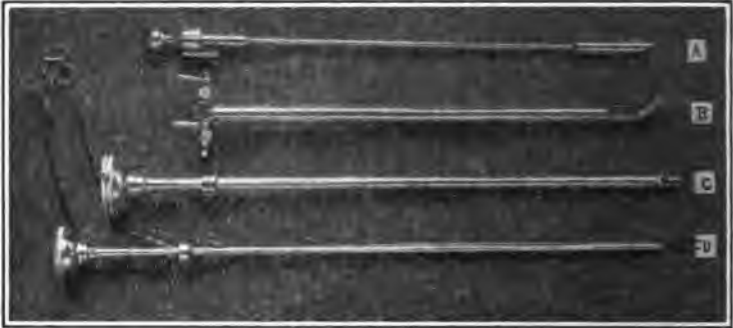


FIG. 103.—Tilden Brown Composite Cystoscope. A, Obturator; B, Common Sheath Penetrated at its Concavity to Permit the Prismatic or Retrograde Telescope to Look Through This Aperture Proximal to the Lamp; C, Prismatic Telescope; D, the Catheterizing Telescope and Catheter.

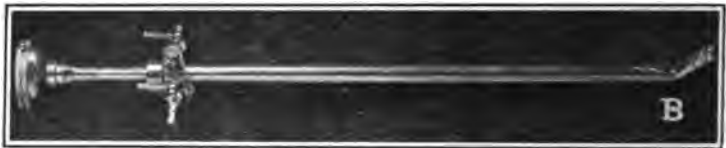


FIG. 104.—Tilden Brown Composite Cystoscope. The Prismatic Telescope Proximal to the Open Lamp.

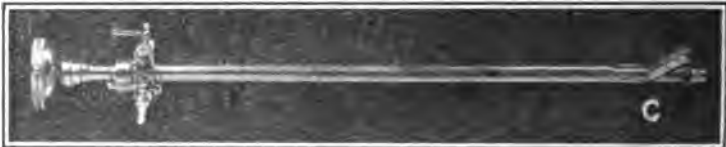


FIG. 105.—Tilden Brown Composite Cystoscope. The Prismatic Telescope Distal to the Lamp.

composite cystoscope (Figs. 103, 104, 105) will be of particular service when requisite for cystoscopic examination, catheterization of the ureter being of secondary importance.

Dr. F. Tilden Brown, using his instrument, performs synchronous ureter catheterization as follows: The patient is placed on the table with legs flexed and supported by a crutch under each knee (Fig. 106), the bladder and urethra



FIG. 106.—Position in Cystoscopy.

are irrigated by means of a suspended bottle syphonage with a warm aqueous solution of Boric acid until the returning fluid is clear, when three to four ounces of the solution are

allowed to remain. The cold lamp is tested, the lamp bearing sheath closed by the obturator is lubricated and passed into the bladder. The obturator is withdrawn and the catheter-telescope, prepared with two flexible catheters fourteen inches long closed by rubber caps, is inserted in its place. The fluid from the bladder is prevented from escaping through the sheath during this interchange by raising the ocular end of the sheath which brings the open vesical end in contact with the bladder floor thus occluding it. The vesical end of the sheath is raised from the floor when the catheter-telescope is all but pushed home to prevent contact with the vesical wall. If the distending solution by any chance escapes, it is quickly replaced through a hose connected with one of the irrigating nozzles on the side of the sheath. If ureteral catheterization is not desired the catheter canals can be closed with rubber caps. The ocular end of the cystoscope is supported with the left hand, the light turned on with the right and the lens focused on the left horn of the trigone, toward the middle of which is seen the mouth of the corresponding ureter. The left eye of the surgeon is applied to the ocular end of the instrument as the focusing of the left trigone brings the outer end very close to the patient's right thigh; when the right urethral opening is examined the right eye is employed. When the ureter mouth is clearly seen the left catheter is pushed forward, engaged in the ureter mouth and introduced into the ureter for about two and a half inches. The right catheter is introduced while the instrument is supported with the right hand. The cystoscope is brought back to the median line and carefully supported to prevent irritating movements. The rubber caps are removed from the catheters, which have been filled with air during the previous steps to prevent the vesical fluid from entering them, and the two culture tubes are innoculated by four or five drops of urine coming from each catheter.

The free ends of the catheters are then turned into sterile bottles holding ten cubic centimeters which are yoked to the cystoscope (Fig. 102). If the bladder becomes over-sensitive at any time some of the distending fluid is allowed to escape. If there is a tendency to vesical tenesmus a suitable warm aqueous Eucaïne or Cocaine solution is introduced through the irrigating channel. The catheters, one after the other, are slowly withdrawn into the cystoscope, the ureter mouth being observed while doing so. The telescope with its catheters is removed, the obturator inserted and the sheath withdrawn. When air is used for distension it should enter the bladder at a temperature of 100° Fahr., being heated by passing it in small jets through a metal cylinder containing Brown's electrically heated coil, the hollow point of which is applied directly to the irrigating nozzle of the cystoscope; this cylinder is suspended over the patient's left leg. A foot pump may be used with advantage.

Occasionally when urethral, prostatic or bladder conditions cause urinary retention and it is desirable to procure some ocular knowledge of the interior of the vesical cavity or to catheterize the ureters the Brown supra-pubic cystoscope is sometimes extremely useful. This consists of an oval trocar and canula which is introduced as nearly opposite the mouths of the ureters as the pubic bone will permit; after withdrawal of the trocar, the electric lamp, angled on its stem, is passed into the bladder, followed by the insertion of any one of the telescopes used in his composite instruments, by means of which an excellent view of the bladder may be obtained, a judicious course of treatment outlined and ureters catheterized. Before withdrawing the canula, a soft rubber catheter bent at a right angle about five inches from its distal end, with an eye at the end and near the side, should be passed through it to the *bas-fond*. This catheter will be embraced sufficiently by the bladder wall to prevent leakage.

The Lewis ureter cystoscope (Fig. 107) possesses many advantages. Air is used to distend the bladder during its examination. It has an ocular tube, terminating at one end in a handle, at the other in a beak which contains a small electric light the electric contact to which is made through the handle. To assist in the introduction of the instrument the ocular canal is closed by an obturator which is removed as soon



FIG. 107.—Bransford-Lewis Double Male Ureter Cystoscope.

as the beak of the instrument enters the bladder. The optical window (Fig. 107) is placed in the outer end of and closes the ocular canal. Through this window the bladder mucous membrane can be inspected as the vesical cavity is distended with air. If it is desired a larger and magnified field can be obtained by using the periscope (Fig. 108) placed in the



FIG. 108.—Periscope.

ocular canal. On the side of the handle of the instrument is a stop cock, through which by means of a rubber bulb (Fig. 109) and the ocular canal air is forced into the bladder; along the shaft of the ocular tube there are appended two parallel tubes to conduct the flexible silk web ureter-catheters to a point within one-half inch of the lamp, and so

arranged that the flexible ureter catheter is practically under full control.

"The position for uretero-catheterization for the Lewis method is what may be termed an elevated lithotomy. The pelvis must be strongly elevated to allow any fluid that drains into the bladder to gravitate to its fundus; the legs are held up by the high stirrups of the operating table, flexed well onto the abdomen. Just before adjusting the patient, a catheter should be introduced into the bladder and that organ drained completely of its contents and antiseptically douched.



FIG. 109.—Air Pump.

"With the patient in position, the cystoscope is introduced into the bladder, the ureter-catheters filling the catheter-tubes to within a quarter-inch of the distal opening, and the obturator in place, to prevent scratching of the urethral membrane. The instrument is properly placed, the obturator withdrawn, the optical window inserted, the air pump attached, and the electric current turned on; at the same time, the operator begins pumping air slowly into the bladder, watching the effect as the bladder walls unfold. The pumping should be done by the operator himself and only sufficient air should be injected

to moderately inflate the bladder, as the latter is intolerant of too much air-distension. Hot air should be used (cold air being irritating); obtained by placing the metal cup of the air-pump over an alcohol flame, from which the warmed air is sent directly into the bladder. If at this point it is found that there is still too much fluid in the bladder, covering the field of inspection, it is best to turn the stop-cock of the air tube, remove the window, and introduce the bulb-aspirator



FIG. 110.—Male Aspirator.

(Figs. 110–111) directly through the cystoscope, reaching to the bottom of the bladder cavity and sucking out the fluid by successive aspirations; after which the window is replaced, the inflation renewed, and a ureter opening looked for.



FIG. 111.—Aspirator Bulb.

“If in the manipulations air-bubbles lodge in the ocular canal or the electric light window becomes too much clouded with blood or mucus, either may be removed by the use of a cotton-tipped swab, without withdrawing the cystoscope from the bladder. But in using the swab special care should be observed that the cotton is tightly twisted on; and this is facilitated by dipping the tip into the lubricant before putting on the cotton. If, by chance, the cotton should drop off into the bladder, it may be withdrawn by sucking it against the aspirator and then pulling it out.

“The ureter opening should be seen at a point about three-quarters of an inch from the median line, and a half or three-quarters of an inch from the neck of the bladder that hugs

the cystoscope ; this distance may be estimated by partly withdrawing the cystoscope until the hugging membrane is brought into view. As the exact location of the openings vary in different cases, and likewise the behavior of the neck of the bladder in dilating, it often requires some manœuvering of the cystoscope to bring them into view, such as pushing aside the membrane at the neck, etc ; at others, the opening is the first thing seen and the catheterism is accomplished without the slightest difficulty.

“ When the ureter opening is found, the operator holds the cystoscope over it with the left hand, gives the air pump to an assistant (who should continue gentle but sufficient inflation), and with the right hand pushes the ureter-catheter into the opening and up into the ureter for several inches.

“ If it is desired to catheterize the other ureter the first catheter should be inserted rather far up to insure against pulling it out in the further manipulation. Then the beak is directed towards the other ureter opening ; when it is found the remaining catheter is pushed into it in the same manner as previously described. If small growths exist they can be removed by changing the window and introducing the various operating instruments necessary to remove the offending outgrowth.

“ The electric cord and air pump is detached, allowing most of the air to escape ; and while the catheter is left in the ureter, the cystoscope is gently taken out, the ureter-catheter being fed into the instrument as the latter is withdrawn. The ureter-catheter may be left for a half hour, draining into a sterilized, clean bottle, or test-tube, the quantity sent down from the kidney in that time being recorded. During this period the patient lies comfortably in a natural position on the table, or he may be removed to his bed, where he is drained in the same manner.”

If it is desired to wash out the kidney pelves, this is done

after finishing the drainage. A glass funnel with four or five feet of soft rubber tubing attached is filled with hot saturated Boric acid solution and connected with the ureter-catheter by a smaller piece of glass tubing, a piece of glass tubing helping in the transition between sizes, if necessary.

After these several manipulations, irrigations of the bladder should be carried out with some mild, soothing antiseptic, such as warm aqueous solution of Boric acid.

As catheterization of the ureters, which seemingly is of so great importance, is difficult and sometimes impossible, even by experts, the Harris method of segregation of the urine has been well received, and, as a rule, gives excellent results. In a case of segregation by the author, one kidney secreted a urine of deep straw color, of a specific gravity of 1020, and the opposite, a pale and watery urine of 1014. With this instrument the segregated urine can be evacuated under Cocaine anæsthesia, and often is of great diagnostic value. Harris describes his method as follows :

“The instrument consists of a double catheter, each being separate throughout, but both being enclosed in a common sheath throughout its shaft or straight portion, thus giving it the appearance of a single flattened tube. Each catheter is separately movable about its longitudinal axis within the sheath. The sheath is 19 cm. in length, and graduated in cm. along its upper surface. The proximal portion (in reference to the patient) is curved, forming an arc of about 60 degrees of a circle, with a radius of 35 mm. This curved portion does not pass at once into the straight portion, but is set on a slight forward angular displacement about 3 or 4 mm. in length. A transverse section of this curved portion of a single catheter is approximately a semi-circle, so that when the flattened surfaces of the two catheters are opposed it is nearly round. In the flattened surfaces and the lateral portions of the semi-circular surfaces are a number of small per-

forations. The distal extremity of each catheter is round and curved in the same plane as the proximal extremity, forming about a quadrant of a circle, the same as the curved end of an ordinary male sound. The curves of the two extremities being in the same plane, the distal end will always indicate accurately the exact direction of the proximal end. At about the junction of the distal curve with the straight portion is a short tube continued in the line of the straight portion and opening into it. The distal extremity of each catheter is connected by means of a short piece of rubber tubing with a separate glass vial. The corks of the vials are doubly perforated, and each vial is finally connected by a piece of rubber tubing with a single rubber exhaust bulb. There is a metal lever about 29 cm. in length, with a handle at one end, the opposite extremity being suitably curved and flattened laterally. This lever is provided with a single perforation near the handle, is flattened on its sides, and notched along its lower border. A detachable curved, forked metal piece connects the catheter with the lever when in use. This connecting-piece is provided with a spiral spring arranged to catch in the notches on the under surface of the lever. The instrument is used in the following manner: The patient, male or female, is placed comfortably on a table in the ordinary lithotomy position, the hips being as high as the shoulders, and the buttocks at a sufficient distance from the end of the table to provide space for the resting of the vials. The bladder should be irrigated with sterilized water before introducing the instrument, even when there appears to be no question as to the location of the pathological process.

"After irrigating, from one hundred to one hundred and fifty cubic centimetres of water should be allowed to remain within the bladder. This facilitates the turning of the instrument after its introduction and diminishes the liability of exciting hemorrhage from a sensitive or inflamed bladder

wall. Before introducing the instrument the forked piece should be fixed to the catheter exactly at the point indicated. It is necessary to be precise in this matter, as the point of fixation is what determines the height of the partition or septum in the bladder, and any deviation from the point indicated may produce an imperfect partition.

"The catheter, sterilized by boiling, closed and slightly lubricated with Lubraseptic, is then introduced. To prevent the fluid in the bladder escaping, the tips of the instrument must be closed, the straight ones by a short piece of rubber tubing, the curved ones by a piece about twenty centimeters in length.

"While the catheter is maintained accurately in the mid-line the lever, passed through the fork, is introduced into the rectum or vagina, respectively, until the perforation near its distal extremity is opposite the perforations in the forked piece, when it is fixed by the little pin. In the female, the first or second perforation, numbering from above, is used, while in the male one of the lower holes is used in order to accommodate the varying-sized prostate. In a small or close vagina there is, at times, a tendency for the inner end of the lever to slip to one side of the catheter before it is opened, being drawn forward by a firm lavator ani muscle. This is easily guarded against by holding the lever firmly in the mid-line.

"The instrument is now opened by rotating the catheters slowly and gently until the distal extremities point outward and backward, where they are fixed by the small spiral spring. The large spiral spring is caught in the notches on the lower border of the lever so as to produce moderate pressure only, thus gently crowding the inner end of the lever between the diverging ends of the catheters. Upon opening the instrument it almost always assumes its correct position as regards the base of the bladder; to insure that it is not too

far in, it should be gently drawn on until one feels the resistance of the tissues to its further withdrawal. When held properly in position, the lever should be horizontal, the catheter itself having, at all times, an inclination upward and outward. The end of each catheter in the bladder now occupies the bottom of a little pocket, the pockets being separated by a perfect septum or watershed. The ureters open, one on either side of the watershed, near the base of the declivity in the immediate vicinity of the respective ends of the catheter. The rubber tubing closing the curving tips is now removed, and the fluid in the bladder permitted to escape, after which the catheters are attached to the vials, right and left, respectively.

“ If for any reason, it is deemed desirable further to irrigate the bladder, after the introduction of the instrument, it may be done through the straight tips before detaching the tubing from the curved tips. If hæmorrhage is excited by the introduction of the instrument, the bladder should be irrigated with hot water until all bleeding ceases and the water returns perfectly clear.

“ After emptying the bladder, the first fluid that drops into the vials is simply the water that remained in the catheters and tubes and must be discarded. As each catheter and tube holds about three or four cubic centimeters of fluid, the operator must wait until that much urine has come down from each kidney to displace the water before collecting for examination or timing the flow. The aspirating bulb should be used but sparingly and only with the greatest gentleness. Vigorous manipulation is never permissible, as it is not only painful to the patient, but may excite hæmorrhage from the bladder. Its use, however, cannot with safety be dispensed with entirely, as the abdominal walls may be so lax as to produce, when lying down, almost a negative tension in the bladder, so that the urine may accumulate in the bladder in sufficient

quantity to overflow the septum unless kept aspirated by the bulb. Usually, when the flow is once started, the dependent position of the vials and tubes produces sufficient syphonage to insure the immediate escape of the urine as soon as it leaves the ureters, without the further use of the bulb.

"The flow of urine usually begins as soon as the instrument is adjusted, but this is not always the case. It frequently happens that four or five or even more minutes elapse before the urine begins to drop into the vials. There appears to be a slight or temporary suppression. Sometimes there is a wait of fifteen to twenty minutes for the flow to begin; but, when once started, it proceeds with regularity. The flow is never continuous, but always intermittent; four to six drops every few seconds, first from one side then from the other."

Cathelin's segregator is the latest and seemingly the simplest and most valuable device for urinary segregation. The instrument consists of a cylindrical tube, twenty-five millimeters in circumference, containing three canals—a central one for the shaft and two lateral metal catheters—and terminating in a short beak similar to the Thompson stone searcher. The central canal pierces the beak at its junction with the shaft and continues forward on the convex or under surface as a gutter. The particular value of the segregator depends upon the introduction into the bladder through the central canal of a shaft handle, connected with a very soft rubber membrane set in a delicate spring; as the shaft is released and pushed forward the spring opens and adapts itself to the walls of the bladder, stretching the rubber tense and dividing the bladder into two lateral halves, the gutter in the beak preventing the membrane assuming other than a vertical position. The metal catheter collect the urine from each half and convey it into separate bottles.

The patient is prepared in the usual manner for cystoscopy;

and the bladder distended with about two ounces of a sterile Boric acid solution. The central shaft of the instrument is introduced through its canal until it projects from the vesical end. This projecting end has a small spring which is easily separated to receive the stem of the rubber membrane which must be placed vertically in the median line. On releasing the spring the stem is firmly grasped and held. After immersion in olive oil, the membrane is drawn back into the tube until the zero mark on the graduated shaft is reached. The closed segregator is lubricated with Lubrichrondin and introduced in the same manner and with the same care as a urethral sound. When the beak has fully entered the bladder the instrument is drawn forward horizontally until the curved end is arrested by the posterior aspect of the pubes and the bladder wall, the handle elevated a trifle and placed in the retaining stand. Pushing in the shaft liberates the elliptical membrane which divides the bladder into two comparatively tight apartments. The capacity of the bladder is estimated by the Guyon method, *i. e.*, introducing fluid by means of a catheter and vesical syringe until the desire to urinate is experienced; this point is known as the minimum vesical capacity, which varies from ten grammes (about one-third of an ounce) to three hundred grammes (about ten ounces); when the desire becomes imperative, it indicates the maximum capacity. The shaft which is pushed forward to correspond to the minimum vesical capacity as registered in grammes on the shaft, after the blood cavity is divided by the rubber membrane into two compartments. The metal catheter tubes are turned downward so that their eyes project well into the vesical capacity, when the contents of the bladder will commence to flow from the catheters immediately. All the fluid injected into the bladder should be evacuated before the urine is collected.

SECTION XII.

ANATOMY, ANOMALIES, INJURIES AND DISEASES OF THE BLADDER.

Anatomy.—The bladder is a musculo-membranous pouch situated in the pelvic cavity in front of the rectum and behind the symphysis pubis. It is ovoidal in form, though its contour varies greatly, depending upon the degree of distension. When completely empty it sinks deep into the pelvic cavity, the long axis running downward and forward. On section antero-posteriorly it is Y-shaped, the stem corresponding to the urethral prolongation. When slightly distended it is somewhat rounded and when over-distended it becomes ovoid and may extend upward as high as the umbilicus. In the aged it sinks deeper into the pelvic cavity, and when distended becomes spherical. The bladder of the infant usually lies higher in the pelvic cavity than that of the adult. The desire to evacuate the bladder ordinarily occurs when it is distended with about eight ounces of urine, though some do not feel the necessity until fifteen or more ounces have accumulated. The neck of the bladder is funnel-shaped and when the bladder is distended it forms an obtuse angle with the body of the organ. The neck is fixed and firmly held by the surrounding prostate and the musculo-fibrinous attachments to the pubic arch. Posteriorly the bladder is bound to the rectum, seminal vesicles and vas deferens by loose elastic tissue; above and anteriorly it is supported and protected by a reflection of the peritoneum, which passes from above the pubes over the anterior surface of the bladder and somewhat down

upon its sides and posterior surface, where it extends backward upon the rectum. The peritoneal covering is connected to the bladder wall by a layer of very loose cellular tissue which allows of the greatest degree of motion as the bladder expands or contracts. The space between the anterior wall of the bladder and the inner surface of the pubes, the suspensory ligaments and the anterior reflection of the peritoneum is filled with loose cellular tissue; it is known as the space of Retzius. When the bladder is distended this space becomes from one and one-half to three inches long and offers an operative route for the relief of bladder disorders. Sometimes, however, the peritoneum is anteriorly so deeply reflected that the space of Retzius is obliterated. When the bladder is empty or only slightly filled the lower border of the peritoneal reflection generally extends below the upper border of the pubes. Behind the bladder and the peritoneum, on either side, the ureters pass down and enter the bladder at an acute angle about an inch from the median line and one and one-half inches from the urethral orifice. Between the ureteral orifices and the vesical opening of the urethra is a triangular space known as the trigone. Attached to the apex of the bladder and extending upward to the umbilicus is a thin fibrinous cord, the remains of the urachus. In thickness the bladder wall varies from three-eighths to one-quarter of an inch, and consists of two layers of muscle fibres, a sub-mucous and a mucous coat. The muscle fibres of the outer coat are longitudinal and those of the inner generally circular.

The mucous membrane is of a pale salmon color. It is smooth over the trigone, though in other portions of the bladder, when empty, it lies in folds. It is covered with stratified pavement epithelium. The glands of the membrane are numerous except in the neighborhood of the trigone. They are composed of clusters of simple follicles and are exceedingly small. When this membrane is perfectly healthy it

does not allow any of its contents to pass back into the circulation. The arterial supply of the bladder is derived from the superior, middle and inferior vesical arteries which *freely* anastomose. The veins are numerous, lying in three planes, *e. g.*, the sub-serous, the intermuscular and the *submucous*. They anastomose freely with the prostatic and Santorini plexus of veins, and empty into the hypogastric vein. The lymphatics while not numerous are connected with the iliac glands. While the bladder is not sensitive to touch it is very sensitive to sudden over-distension. The internal sphincter may be considered as the true guardian of the bladder outlet, keeping the urine from flowing into the prostatic urethra until the bladder is filled to its physiological capacity. When this occurs, urging to urinate becomes noticeable and, through reflexes in the lumbar portion of the cord, the detrusors of the bladder contract and the sphincter opens allowing the urine to enter the posterior urethra, when a sharper and more imperious call to micturate is felt. For a certain time this desire to urinate can, by voluntary contraction of the internal sphincter, be prevented, and the few drops of urine in the prostatic urethra may by the will power be driven back into the bladder, but if Nature's call be not soon obeyed urinary incontinence will follow.

ANOMALIES OF THE BLADDER.

Complete absence of the bladder, with the ureters terminating either in the urethra, the rectum, the vagina, or upon the surface of the abdomen, is of rare occurrence. It is usually associated with other anomalies which cause early death. If life is prolonged, a properly-fitting urinal or the implantation of the ureters into the rectum may be necessary.

Supernumerary Bladders.—These anomalies are infrequent. Mollinette reported a case of a woman with five distinct bladders, five kidneys and six ureters. Four of the

uterers opened into individual bladders and two into the largest vesicle. Multiple bladders are generally sacculated and communicate with each other. They may be counterfeited by dilatation of the lower ends of the ureters.

Treatment.—If cystitis becomes troublesome, and it is not relieved by the usual medication, bladder drainage may become necessary.

Antero-Posterior Division of the Bladder.—The transverse partition is usually anterior to the ureteral openings. In the cases reported the urine was discharged from the ureters into a large posterior cavity, from whence it passed through a small circular opening in the upper middle portion of the separating partition into the anterior or smaller cavity. The partition was double the thickness of the bladder wall. The anterior cavity had a capacity of about an ounce, and its walls were spanned by numerous fine fleshy columns resembling the columnæ carnæ of the heart. The bladder wall and the abdominal parietes were much hypertrophied. Clinically there had been from boyhood frequent calls to micturate accompanied by straining and sometimes paroxysms of pain in the left groin, with occasional attacks of incontinence from urinary retention. Hæmaturia was occasionally present. At the Metropolitan Hospital, the author recently found a similar anomaly, the anterior cavity containing a small calculus, which was treated by dividing the bladder partition and removing the stone through a supra-pubic route.

Lateral Subdivision of the Bladder.—This malformation signifies a partial or complete division of the bladder by a median partition, each cavity having a distinct ureter opening into it and often a special urethral exit.

Cystocele.—Whenever the linea alba is weak, deficient, or the aponeurosis of the external oblique is undeveloped, a congenital protrusion of the bladder may occur. Cystocele, however, is generally caused by some injury to, or disease of, the

protecting walls of the bladder, its supporting parts, or both, as exemplified when the abdominal wall is weakened by a laparotomy or abscess, loss of adipose tissue, over-distension, etc., or when the barrier at the inguinal, femoral, obturator or ischiatic foramen becomes deficient. In the female, cystoceles frequently occur after child-birth. Deficiency in the support of the bladder is not in itself sufficient to produce a cystocele; there must in addition be frequent over-distension of the viscus, straining during micturition, etc. When these conditions are present, and a portion of the bladder protrudes, a sacculation may occur, the portion of the wall involved losing its contractile power through frequent distension, which permits of a certain degree of retention, with possible decomposition of the retained urine and a resulting cystitis, which may terminate in ulceration, sloughing of the walls of the bladder or the formation of calculi. Cystoceles, unless of large size and preceded or accompanied by a hernia, are, as a rule, not covered by peritoneum.

Cystoceles may be mistaken for hernia, abscess of the groin, diseased conditions of the testes, etc. They increase in size with retention of urine, and decrease when the urine is evacuated. They appear as soft, flaccid or tense tumors which give a dull note on percussion. If a cystocele becomes strangulated, the symptoms produced are similar to those of strangulated hernia, with the exception that the vomiting is always preceded by hiccough and there is, in addition, frequent and painful micturition.

Treatment.—The bladder must be emptied at proper intervals and a suitable truss worn at all times. If the cystocele is irreducible, the protruding parts should be returned to their normal positions and retained by repair of the deficient supports.

Exstrophy of the Bladder.—This malformation is due to failure of development of the anterior wall of the bladder and

the corresponding portion of the abdominal parieties. True exstrophy always signifies a deficiency in the bladder wall. The degree of non-development varies greatly. Hache describes nine varieties. If the bladder is intact but projects through an incomplete abdominal wall, the anomaly is known as ectopy vesicæ urinæ. Often there is an associated lack of growth of the pubic bones at the symphysis. When the vesical opening is situated near the vertex of the bladder and the symphysis pubis is not involved, it is termed a fissura vesicæ superior; when the lower portion of the anterior vesical wall is involved and the symphysis is normal, it is a fissura vesicæ inferior; when there is a deficiency in the anterior wall of the bladder and the pubic bones are separated at the symphysis, it is designated as an eversio vesicæ.

Exstrophy of the bladder is generally associated with malformations of the neighboring parts, epispadias of the penis or clitoris being the most frequent. Sometimes the posterior wall of the bladder is incomplete and communicates with the intestines or rectum. Exstrophy occurs nine times more frequently in the male than in the female. Neudorfer says it happens once in every 100,000 births, and nine-tenths of the victims die within a few days. The centre of the hypogastric region in this malformation presents an irregular circular or oval bulging, rough, moist, bright red, mucous surface, which bleeds easily, and varies in diameter from an inch in the infant to three inches in the adult. As a rule, there is no special vesical cavity, though in the recumbent position, which allows the vesical wall to gravitate towards its normal position, there may be one of considerable size. If the bladder is pressed back a little, a small prostate lying at the junction of the bladder and penis becomes exposed, and the verumontanum and ejaculatory ducts are often presented to view. The mucous membrane may expand or bulge during inspiration, or coughing and gurgling in the vesical cavity

can at times be heard; it is sometimes reducible. Two small openings, from which the urine trickles, mark the orifices of the ureters. The vesical opening is usually encircled by a zone of granulation tissue, and the surrounding skin is inflamed and excoriated. Victims of exstrophy of the bladder are annoyed by erotic fancies and nocturnal pollutions. They are usually incompetent to perform the sexual act. Generally they become weak and debilitated, and die from some ascending inflammation of the urinary tract. Exstrophy of the bladder is, however, compatible with robust health.

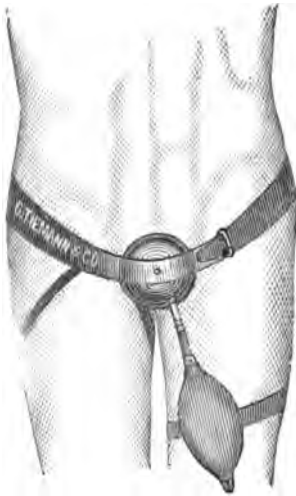


FIG. 112.—Tiemann's Instrument for Exstrophy of the Bladder.

Treatment.—The patient can sometimes be made very comfortable with a properly fitting urinal, Tiemann's (Fig. 112) being the best. Surgical relief is generally not only indicated, but imperative. As a rule, it should not be attempted until after the fourth year. In all surgical methods of cure the death rate is very high, and numerous successive operations are often necessary to eradicate the defect or to even afford relief.

When the fissure is small the vesical cavity may be closed by denuding the edges of the cleft and uniting them with proper sutures; in others it is advisable first to dissect off the requisite amount of mucous membrane and turn it into the bladder cavity before suturing the denuded surfaces. If the exstrophic opening is of considerable magnitude, one of the following operations will be necessary, *i. e.*, the implantation of the ureters into the

rectum ; the establishment of a fistula between the bladder and the rectum ; the dissection of the vesical mucous membrane, excepting that portion surrounding the openings of the ureters, and suturing it to the base of the accompanying epispadias ; the uniting of the two margins by proper sutures and approximating the pubic bones at the symphysis, or by the cutaneous flap or auto-plastic method, which is the most frequently attempted. Numerous modifications of the latter method have been suggested. Sometimes surgical operations for relief are successful ; more frequently, while the bladder is not completely closed, the exposed surface is hidden and the point for discharge of the urine located where it admits of the successful application of a urinal. However, the growth of the hair on the inverted skin forming the anterior wall of the bladder often causes much annoyance and discomfort. Calculous formations have frequently occurred after this operation.

Wood's Operation.—All hair follicles in the area of the proposed skin flaps must be previously destroyed by electrolysis. In making and separating the flaps, care must be observed not to devitalize or injure them by rough manipulation, or by making them too thin. The first flap is formed above the defective bladder, and must be of sufficient size, when turned down, to completely cover the exposed mucous surface ; the length of this flap must be equal to the distance from the root of the penis to the upper margin of the exposed bladder. It is outlined by an incision carried vertically upward the required distance from the side of the exposed viscus, thence convexly across the abdomen to a point complementary to the junction of the original vertical and the transverse convex incision on the other side of the abdominal wall and down to a corresponding point on the opposite side of the exposed mucous membrane. This flap is brought down and secured with catgut sutures to the freshened skin

border of the congenital cleft and into the incision at the root of the penis. The denuded outer surface of the upper flap is covered by lateral flaps, the raw surfaces of which are turned inward, and applied over the raw surface of the first. They are rectangular in contour, attached by their pedicles to the base of the scrotum and are formed in the inguinal regions. The incision begins on the side of, and is carried down one-half the length of, the urethral groove. The flaps must be of sufficient size, when dissected free, to be approximated in the median line without tension. The inguinal flaps are sutured in the middle line and at the lower part and brought closely together at the root of the penis. The raw surfaces from which the flaps are taken should be closed with plate sutures or hair-lip pins.

Thiersch's Operation.—In this method of relief, to allow for shrinkage, the flaps should be outlined much larger than is apparently necessary. The first flap is made by an incision through the skin and subcutaneous tissues, commencing at the upper border of the exposed mucous membrane, extending along its side to the root of the penis; the second incision is made parallel to the first, and extends to Poupart's ligament. In width the flap should be two-thirds the vertical measurement of the exposed viscus. After the flap is dissected from the underlying tissues, it is separated from them for three weeks by a properly shaped piece of tin-foil. At the end of three weeks the upper attachment is divided, and the severed end is carried across the lower part of the exposed bladder surface and secured by sutures to the freshened margins of that side. When this has united, a similar flap is cut on the opposite side, though the incisions are located higher, the lower point corresponding to the upper attachment of the lower flap. In three weeks this is separated and sutured to the freshened edges of the opposite side. When it is completely united, the adjacent edges of the flaps are denuded and

sutured; the complete flap is then sutured to the upper border of the bladder, and, finally, union of the lower border is attempted. This surgical procedure requires much time and patience. Incomplete union or failure is more frequent than union, and years may be necessary for its completion.

Branth Operation.—The bladder is detached by dissection from its attachments above and the exposed mucous membrane freshened at the edge and united by Lambert sutures. An incision is then made just anterior to the scrotum and below the pubes, and the penis drawn out through it with a hook. In this manner the fundus and almost the whole bladder is brought down into the pelvis, behind the pubes, where it is fastened by catgut sutures to retain it in its position. The integument at the root of the penis is denuded and united to the wound, through which it now protrudes. The freshened tendinous portions of the transversalis and oblique muscles ensheathing the rectus muscles are easily sutured by a continuous or interrupted suture, similar to that employed in modern perineorrhaphy, which secures firm union, the urine being discharged through the groove in the epispadiac penis of the defective urethra. Later, efforts may be necessary to form a roof to the urethra, a problem which seems possible of solution.

Maydl's Operation for implantation of the ureters into the intestine is sometimes successful. The peritoneal cavity is opened along the borders of the defect, ureteral catheters introduced well into the ureters and the entire mucous membrane, with the exception of a small oval portion surrounding the orifice of each ureter, resected. This section is made freely movable by dissection, and sutured into a longitudinal opening of sufficient size in the colon. The first line of sutures unites the mucous membranes, the second the serous and muscular coats of the gut, and the operation is completed by closing the abdominal cavity as in a laparotomy.

Beck's Operation.—The irritated adjacent integument having been prepared for operation by prolonged baths, cauterization and application of unguents, the margins of the protruding bladder walls are freed and the tissues dissected back one centimeter from the line of incision to allow the freshened margins to be approximated without tension. Both recti muscles are exposed and severed completely from their attachments at the pubes and sufficiently from the transversalis fascia so that the flaps to be formed from the belly of the muscles may be reflected and united to form the anterior wall of the viscus, an incision is carried along the centre of their long axes to the extent of a little less than one-half their thickness which corresponds in length with the vertical length of the bladder. Two transverse incisions extending from this incision to the inner margin of the muscle of same depth complete the outline of the flaps, the lower being near the symphysis pubis and the upper below the umbilicus. Beginning at the margin of the internal incision the recti muscles are divided from without inward until flaps are formed which can be lifted from their original beds after the manner of hinges, when the reflected muscle flaps and the bladder walls are united by buried catgut sutures and twin silkworm gut sutures. The integument should be united with subcutaneous sutures, supported by four silkworm gut fixation sutures placed three-quarters of an inch from the line of union. This operation gives a small bladder, but a firm muscular wall or layer, which may in time dilate.

Sonnenberg recommends removal of the entire bladder and insertion of the ureters into the penis. Tizzoni and Foggi have constructed a new bladder from a loop of the small intestines. The vermiform appendix has also been used for the same purpose. It has been suggested that the bladder and rectum may be combined into one receptacle. Maydl has attempted to form a valve at the ureteral opening to prevent ascending pyelo-nephritis.

From the ever-increasing varieties of surgical methods advocated for relief of this annoying anomaly it is evident that each case must be individualized. Direct union should always be favored, though the entire aspect of the anomaly must be borne in mind.

Patulous Urachus.—This congenital defect is infrequent; it may be complete or incomplete. When complete, the urine escapes at the umbilicus; when incomplete, it may present one of three varieties, *i. e.*, the urachus being open at the vesical end and closed at the umbilicus; open at the umbilicus and closed at the vesical end, or closed at both ends, but patent throughout the remainder of its length, the latter form appearing as an elongated cystic tumor, which occupies the position of the urachus.

Treatment.—If the urinary leakage is due to over-distension of the bladder produced by some occlusion of the natural outlet, the obstruction must be removed by a proper urethrotomy or meatotomy. When the urinary drainage is normal it may be necessary to expose the parts by a laparotomy, when the patulous urachus may be cauterized, its surfaces denuded and approximated by proper sutures, or the urachus may be divided and the lower end invaginated into the bladder and properly sutured. The last operation is especially indicated when the urachus contains a calculus or is patent only in its central portion.

INJURIES OF THE BLADDER.

Wounds of the Bladder.—Lacerating wounds of the bladder wall, without fracture of the pelvic bones, due to direct puncture, are of infrequent occurrence. There are four routes by which the bladder can be accidentally wounded without injury to its bony protecting walls, *i. e.*, through the abdominal parieties, the perineum, the rectum, or the obturator foramina. The greater the degree of distension of the bladder

at the time of the accident, the more readily can it be penetrated.

Wounds of the bladder may be punctured, incised or contused. Punctured wounds vary in importance according to their size, the condition of the urine and the facility for immediate surgical repair. Puncture by the aspirator needle, etc., unless a vessel is wounded or ulceration follows about the minute opening, is generally unimportant, though if the urine is septic or the needle unclean, many unpleasant conditions may result. Incised wounds are generally made accidentally or designedly by the surgeon. If properly closed, they do well; if overlooked, most serious consequences may follow. Often those which accidentally happen during an operation can be avoided by introducing a sound in the bladder, and, during the surgical procedure, having its point from time to time moved by an assistant. Contused wounds are frequent, and may be produced by falling astride a picket fence, being gored by the horn of an animal, penetrated by a bullet, etc. When the pelvic bones are shattered by a bullet, spiculæ of bone may be thrust through the bladder walls and cause a bad laceration.

Wounds of the bladder may also be classified as non-penetrating and penetrating. The non-penetrating from simple traumatism of the external or internal wall of the bladder may accidentally happen during the removal of a pericystic growth with adhesions, the removal of a stone by the lithotrite, etc. Penetrating wounds may be intra- or extra-peritoneal, or both.

Clinical History. — Immediately after the bladder is wounded many of the symptoms, in addition to those of shock, will depend upon the associated injuries of adjacent organs. Urine may escape from the wound continuously, intermittently, or only when there is a desire to urinate, the rent in the interval being closed by a flap of tissue or a valve-like plug of the loose mucous membrane. The urinary fluid

discharged from the wound may be clear, bloody, or consist of blood and clots. It may escape into the peritoneal cavity. The calls to urinate are often frequent and painful, though little or no urine is voided. The secondary symptoms vary with the condition of the urine, whether the penetrating instrument was septic or aseptic, and whether the wound was intra- or extra-peritoneal. Extra-peritoneal wounds of the bladder are the least serious, though urinary infiltration and decomposition in the tissues are common complications. When the wound is intra-peritoneal, the blood and clots with the septic urine, or urine ready to undergo decomposition, etc., escape into the peritoneal cavity, when it usually excites septic infection, septic peritonitis, etc., with fatal results.

Diagnosis.—This can generally be made by a study of the direction of the penetrating object and the course pursued by the urine after it escapes from the bladder. If the wound is intra-peritoneal, the urine may pass into the peritoneal cavity. By introducing a sound or similar instrument into the bladder and passing a long silver probe through the wound, it may be possible to demonstrate the connection of the external opening with the one in the bladder. When there is a question of doubt, immediate laparotomy and closure of the wound, if discovered, is indicated.

Prognosis.—Surgical wounds, if recognized and properly repaired, do well. Those produced by instruments introduced through the rectum and vagina are more serious than when they are introduced through the perineum or hypogastrium. All contused wounds are dangerous.

Treatment.—When intra-peritoneal, laparotomy and repair of the bladder wound, with proper vesical drainage for at least three days. If extra-peritoneal, closure of the wound with the Lambert suture without including the mucous membrane and the institution of proper bladder drainage.

Rupture of the Bladder.—Etiology.—This accident occurs eight times more frequently in men than in women. This is due to their more active outdoor and exposed life. It generally happens between the twelfth and fiftieth years, although it has occurred in children under two years of age. The causes of rupture are predisposing and exciting or direct. Over-distension of the bladder is an exceedingly important predisposing factor in intra-peritoneal and, to a less degree, in extra-peritoneal rupture, distension not only diminishing the thickness of the bladder wall, but bringing it into closer proximity with the abdominal parietes and above the bony protection of the pelvis. General or local insensibility also predisposes to rupture by curtailing the protection given by the abdominal wall which ordinarily acts as a flexible barrier to external violence. The direct causes of rupture may be traumatic or pathological. It may occur idiopathically. Rupture of the bladder may be the result of over-exertion or violence from within as when the bladder is suddenly over-distended with fluid. It has occurred from simple over-distension where it was impossible to obtain surgical relief. The over-distension may be due to urinary retention from stricture of the urethra, tumors, enlarged prostate, retroversion of a gravid uterus, or insensibility from alcoholism, fevers, hysteria, etc.

It may be caused by falls or blows upon the abdomen, from crushing of the pelvis and perforation of the viscus by pieces of broken bone, or from indirect force, as falls upon the feet, the back, or the tuberosities of the ischia, and the usual forms of violence from without. Violent muscular action may also produce rupture, as when pushing or lifting, struggling under an anæsthetic, straining to urinate when the bladder is full from retention due to stricture, enlarged prostate, or other obstruction. Pathological lesions, particularly ulcerating and gangrenous inflammations of the bladder walls may so thin and weaken the vesical coats as to allow rupture to take place.

Idiopathic or spontaneous rupture, when the bladder walls are healthy, is very infrequent.

Pathological Anatomy.—Traumatic rupture generally presents a rent of from one to two inches in length in the wall of the bladder; the idiopathic, a small circular or triangular opening; the pathological varies in contour with the predisposing lesion. Rupture generally takes place in the posterior wall, and, when intra-peritoneal, the laceration is usually vertical, though it may be oblique or transverse. Spontaneous rupture also occurs in this location. One or all the coats of the bladder wall may be involved. The mucous and muscular coats may alone give way and allow the urine to dissect up into the peritoneum and infiltrate the areolar tissue. The bladder, after rupture has happened, often continues to functionate in a varying degree; it may contract like a hard ball. When the rupture is intra-peritoneal, a large quantity of blood often escapes with the urine into the abdominal cavity, and if death takes place within three days, a large amount may be present without subjective evidence of peritonitis; in fact, the peritoneum absorbs normal urine rapidly. If death occurs after three days, and the urine was septic or unclean instruments were employed, evidences of peritonitis will usually be present. In extra-peritoneal rupture, urinary infiltration, etc., develops rapidly, depending upon the location and degree of the tear.

Clinical History.—Rupture of the bladder is attended with intense pain in the region of the organ, with a sensation as if something had given way within the abdomen. It is followed by vomiting, often by faintness, or even collapse with all the symptoms of shock. Standing or walking is generally impossible. If urinary retention has preceded the rupture, the initial pain is followed by a sense of relief, which is, however, soon succeeded by excruciating pain, which radiates over the abdomen. The desire to urinate becomes urgent and trouble-

some, though only a few drops of blood and urine are discharged per urethra. Generally but little urine is voided voluntarily, though there are numerous exceptions. On catheterization only a small amount of urine, bloody in character, will be obtained. If the rupture is intra-peritoneal, the end of a silver catheter, when introduced to its fullest extent, may be distinguished by palpation at a point in the abdominal cavity external to the bladder region. The discharge of fluid through the catheter is often quickened by the respiratory acts. The quantity discharged varies from a few to many ounces and contains blood clots which may obstruct the catheter. When the rupture is intra-peritoneal, a moderately well-defined fluctuating tumor is often formed between the umbilicus and the pubes, or in the recto-vesical space. In extra-peritoneal rupture, the exuded urine produces a doughy, asymmetrical tumefaction; if the rent is in the anterior wall, this swelling may extend above the symphysis pubes and over the abdomen; if in the posterior wall, the distention will form between the bladder and the rectum and extend out from the side on which the tear is most prominent. The urine may by dissection spread upward in front of the peritoneum over the abdomen, downward through the obturator foramina or the inguinal rings into the scrotum, and through the femoral rings to the thighs, etc. Abscess and sloughing generally follow, with pain, chills, fever, vomiting, general depression, and all the symptoms of general septic infection.

Diagnosis.—When extra-peritoneal rupture of the bladder happens, urinary extravasation usually manifests itself within a few hours. When it is of the intra-peritoneal variety, the empty viscus and the ability to pass a catheter into the abdominal cavity through the rent in the bladder wall will certify to the nature of the traumatism. The injection into the bladder of a large amount of warm antiseptic solution through the catheter may also be of great diagnostic value. When in doubt,

immediate laparotomy for diagnosis and repair of the laceration is justifiable. If accompanied by fracture of the pelvic bones the rupture is generally extra-peritoneal.

Prognosis.—When the expectant treatment is followed, rupture of the bladder usually terminates fatally, but recovery may ensue, if the repair is immediate. Mitchell reports ninety cases of extra-peritoneal rupture; thirty-seven were operated with a death rate of 64.9 per cent.; fifty-three received the expectant treatment with a death rate of 96.2 per cent. Sieuer collected thirty-four reports of intra-peritoneal rupture of the bladder, all of which were operated, with a death rate of 58.8 per cent.

Treatment.—If the rupture is extra-peritoneal, continuous urethral urinary drainage by means of a large catheter, kept free from obstruction, and incision of the infiltrated cellular tissue with proper drainage may give satisfactory results. A median or a lateral perineal cystotomy will, however, often be more advisable. If the rupture is intra-peritoneal, laparotomy, removal of the clots and urine, and proper closure of the wound by two rows of sutures in the bladder wound, the first including the mucous and muscular coats, and the second the serous, together with the institution of continuous urinary drainage per urethra, or sometimes an external urethrotomy and perineal drainage, may be advisable. Thorndyke completes the operation by over-distending the bladder with an antiseptic fluid to locate any possible overlooked point of rupture. The peritoneal cavity should be closed and drainage instituted as indicated.

Varicose Veins of the Bladder.—This condition produces but one symptom, profuse, spontaneous, uncontrollable hæmorrhage from the bladder. If vesical irrigations of an aqueous solution of Adrenal extract do not control the bleeding, a supra-pubic cystotomy and ligation of the bleeding vessel may be necessary.

Vesico-Intestinal Fistula.—This may be of **traumatic, ulcerative, cancerous, tubercular or congenital origin.** The pathognomonic symptom is the discharge of gas from the urethra (pneumaturia). The urine may be voided in part or entirely per rectum. The prognosis depends upon the **nature** of the fistula. A congenital fistula of this variety is **very rare**; it is sometimes cured by operative measures. The **traumatic** may heal spontaneously, while the malignant and tubercular are incurable.

Treatment.—This consists in the daily irrigation of the bladder and the bowels with some mild antiseptic solution. Attempts at cure have been made by dilating the fistula and curretting or injecting it with alcohol or an ethereal solution of Peroxide of hydrogen to set up an adhesive inflammation, which might be followed by obliteration of the fistula.

DISEASES OF THE BLADDER.

Hypertrophy of the Bladder.—This condition may occur as a complication of some long-continued disease of the urinary tract which produces urinary obstruction, or from some vesical irritation which necessitates frequent micturition, not necessarily associated with obstruction to the exit of the urine. These two circumstances give rise to two varieties of hypertrophy of the bladder wall, the eccentric and the concentric. In either case the bladder wall becomes greatly thickened, the muscle bands in the interior of the bladder projecting and intersecting each other at different angles, creating a very irregular surface. The pockets formed between the projecting muscular bands often become deep and may retain residual urine or even encysted phosphatic stone. In the eccentric variety there is no special diminution in the capacity of the bladder, the hypertrophy resulting from the necessity on the part of Nature to propel the urine past some obstruction. As time goes on, in the eccentric form of vesical hypertrophy the

muscular tissue becomes incapable of expelling the contents of the bladder, and atony and dilatation follow. In the concentric class often the inflamed mucous membrane, stone, or other irritant does not allow more than an ounce or two of urine to accumulate in the bladder before it excites an imperative desire to micturate. This incessant action not only produces pronounced thickening of the muscular tissue of the bladder wall, but it greatly and permanently reduces the capacity of the bladder. When the concentric hypertrophy is due to an inflammatory condition, the inner surface of the bladder becomes smooth, a condition not present when the hypertrophy is due to other causes.

Treatment.—In the eccentric form the removal of the cause often gives relief. In the concentric variety, the inflammatory or irritative origin must be removed by appropriate treatment, though it is rare when it has been of any considerable duration for the capacity of the bladder to be increased or the frequency of the calls to micturate to be modified.

Atrophy of the Bladder.—Thinning of the bladder wall is generally due to some special lesion.

Cystitis.—This term signifies an inflammation of the wall of the bladder. It has three persistent symptoms: Frequent micturition, painful urination and purulent urine. Its clinical manifestations may depend primarily upon the presence in the viscus of certain ptomaines, chemical or toxic materials, upon a necrobiosis from nerve involvement, a traumatism, or upon infection by one or more of the various forms of pyogenic micro-organisms. It is never idiopathic, and may be acute or chronic.

Roosing classifies cystitis as follows: (1) Catarrhal or non-suppurative cystitis caused by organisms which are devoid of pyogenic properties and do not directly attack the mucous membrane of the bladder, but do decompose the urine. (2) Suppurative cystitis of two main groups: (a), an ammoniacal

form in which pyogenic organisms capable of decomposing the urine are present; (*b*), an acid form for the most part due to the tubercular bacillus. The ammoniacal group (*a*) includes cases in which the bacilli coli communi co-exist with other micro-organisms, having the powers to decompose the urine, or the latter alone, and generally results from instrumentation. The acid group (*b*) is much less common than the alkaline group, is rarely due to instrumentation, but is usually caused by the tubercular or typhoid bacillus, the gonococcus, the bacillus coli communis or the streptococcus pyogenes, which enters the bladder from the posterior urethra or by the ureter from the kidney.

It is not rare that symptomatic manifestations without pathological bladder lesions, due to nervous reflexes from a posterior or anterior urethral inflammation, a lesion of the prostate, seminal vesicles or kidney, simulate cystitis. These cases of false cystitis are always aggravated by intra-vesical medication.

Acute Cystitis.—Etiology.—The causes of acute inflammation of the bladder walls are classified as predisposing and exciting. The predisposing include gout, rheumatism, continued fevers with their toxic urines, chilling of the body, improper and highly seasoned foods, particularly alcohol; increased acidity of the urine, over-distension of the viscus following retention, anything producing congestion, such as the ingestion of Cantharides, Turpentine, Bichloride of mercury, some of the balsams, etc. The exciting causes are of a pyogenic nature such as gonococci, tubercular bacilli, pathogenic urethral germs, etc., which may have escaped from the higher urogenital regions, or been forced back into the vesical cavity during instrumentation, etc.; these germs, however, may be present in the urine in large numbers, as demonstrated in aspirated urine, without producing cystitis. Gonorrhœal cystitis, when it develops, probably depends upon the presence of such predisposing causes as vesical congestion, urinary reten-

tion, rich albuminous urine, etc., or the virulence of the gonococci; but, unless albumin is present in the urine, the gonococci soon die, their existence depending upon the albumin and not upon the acidity or alkalinity of the urine.

The bacillus of Eberth, which is present in the urine in typhoid fever in 20 to 30 per cent. of all cases, often induces acute cystitis. The bacilli are not generally in evidence before the third week of the disease, when they appear as a pure culture in enormous numbers, Petroschky estimating them at 170,000,000 to the cubic centimeter of the urine. The urine may be distinctly cloudy from their presence. Without treatment the bacilli may persist for weeks, months or even years after the seeming disappearance of the typhoid condition.

The common determining germ of cystitis is the bacillus coli communis, which may find entrance to the vesical cavity through the kidney or the lymphatics. The irritants present in the urine, may be derived indirectly from ingestion, directly from bladder douches or the presence of dead tissue from imperfect innervation.

Pathological Anatomy.—The mucous membrane, especially about the trigone, becomes red, swollen, inflamed and covered with a mucous exudate, the epithelium eroded in spots and the blood-vessels prominent. The whole mucous membrane may be exfoliated as the result of over-distension or diphtheritic exudation. The muscular and serous coats present evidence of involvement. Small abscesses may develop, empty into the bladder cavity and leave ulcers.

Clinical History.—The symptoms vary greatly in intensity. Sometimes there is only a slight increase in the calls to micturate followed by continuous unsatisfied feeling, which passes off in a few hours or days. There may be a constant desire to urinate, inability to retain the urine, with tenesmus, burning, smarting and stinging during the act, pain in neck of bladder, at the end of the penis, in the perineum, or extending down

the thighs with soreness and uneasiness in the region of the bladder which is greatly increased by palpation over the hypogastrium, or by examination per vagina or rectum. At first the urine may be free from pus. When pus is present it is diffused throughout the urine giving it a milky appearance, and is most pronounced in the urine voided at the beginning and end of urination. Fever is always absent unless there is an accompanying prostatic, perivesical or uretero-renal inflammation. When the cystitis is due to the bacilli coli communi the reaction of the urine remains acid.

The gonorrhœal variety of acute cystitis may appear during the second, though rarely before the end of the third week of the specific urethritis. It varies greatly in duration and intensity, and is generally induced by injudicious instrumentation, alcoholic beverages or exertion. The urethral discharge lessens or ceases on the appearance of the cystitis, to return on its cure. Fever is absent. Tenesmus and frequent desire to urinate are especially noticeable. The urine has a milky or bloody appearance and contains a tenacious, stringy matter resembling thin glue. When the urine is allowed to stand it separates into an upper or clear layer and a lower greenish, thick sediment, which is composed of pus and blood corpuscles some blood clots and numerous micro-organisms.

Acute cystitis in children due to the bacilli coli communi begins with an irregular fever, and is followed by painful and frequent micturition, the urine voided containing albumin, an abundant deposit of mucus, pus, epithelial cells, and large numbers of the bacilli coli communi.

Diagnosis.—The only disease with which acute cystitis may be confounded is acute prostatitis, which is readily differentiated by the rectal examination revealing a hot, throbbing, swollen prostate.

Prognosis.—Acute cystitis terminates in recovery or in the chronic variety.

Treatment.—When the cystitis is severe, rest in bed with elevation of the hips is essential, together with the application of hot fomentations or poultices to the hypogastrium and perineum. When there is evidence of retention, and percussion and palpation show an enlarged, distended bladder, catheterization will be advisable. If caused by stricture, stone, etc., surgical relief is indicated.

The diet must be light, farinaceous, non-irritating and easy of digestion. Milk is the classical diet. The use of meat is generally contra-indicated and, when allowed, should be limited in quantity. Asparagus, coffee, salt and lemon juice must be interdicted. Fresh fruit may be eaten in moderation. Alcohol should be prohibited except in the aged, who may require stimulation, when whiskey well diluted with water or milk may be given. Pure spring water may be taken as desired unless it unduly increases the frequency of the calls to micturate. When the cystitis is caused by the bacilli coli communi a brisk Calomel purge should be administered at the beginning of the attack to clear the intestines of these micro-organisms and, during the continuance of the attack, a daily evacuation of the bowels should be secured by Rubinat or Hunyadi water. Hot sitz baths at 100° to 105° Fahr. often relieve the vesical irritability.

Alkaline diluents are generally beneficial, though they should not be administered when the cystitis is due to the presence of the bacilli coli communi. If the urine is highly acid and deposits uric acid crystals, Citrate or Bicarbonate of potassium may be useful in reducing the degree of urinary acidity and in allaying the irritation. A tablespoonful of the following mixture: Sweet spirits of nitre, four drachms; syrup of lemon, to make three ounces; diluted with water and given every three hours, is valuable for palliation.

When the urine is alkaline, Boric or Benzoic acid in five grain doses administered three times a day, may be beneficial.

When phosphates are present, with ammoniacal decomposition of the urine, Cystogen, Helmatol or Urotropin will be very efficacious. When the cystitis is due to the presence of the typhoid bacillus, Urotropin, whether the urine be acid or alkaline, is always indicated; Salol in ten-grain doses is sometimes of benefit; Boric acid seems to have no effect. Einhorn recommends Methylene blue, fifteen grains three times a day, when the urine contains large numbers of bacteria.

Vesical tenesmus and pain may be relieved by one-half grain Morphine rectal suppositories one or more times daily. Sandalwood may afford relief to the frequent and painful calls to micturate. Infusions of Triticum, Buchu, etc., are useful. The only form of local treatment ever permissible is the application, with an Ultzmann's or a Bang's syringe sound, to the prostatic urethra of twenty drops of a solution of four to ten grains of Nitrate of silver to the ounce of water. It often gives much relief when there is a pronounced vesical irritability. If an abscess forms in the wall of the bladder, it should be opened and drained as soon as its presence is recognized.

The following symptomatic remedies are often alone curative:

Aconite.—Is useful for congestions and inflammations of the mucous membrane, particularly when caused by a chilling of the surface of the body. Urine scanty, red and hot, sometimes mixed with blood; tenderness over the hypogastric region; burning pain in the bladder; burning and tenesmus at the neck of the bladder; sudden retention of urine from cold, accompanied by great restlessness, dry, hot skin, hard and quick pulse.

Cantharis.—The cystitis calling for this remedy is of a high inflammatory grade. Hæmaturia is usually present. It may be accompanied by chill and fever. Urine at first is clear, soon becoming turbid, scanty or bloody. The specific gravity is always high and the reaction always acid. Micturition is

painful, the urine being voided drop by drop, with a sensation as though melted lead were passing down the urethra, accompanied with violent straining. Spasmodic pain of the bladder with urgent desire to urinate; thirst, but drinking always increases the pain in the bladder.

Dulcamara.—Particularly useful when the cystitis has been caused by exposure to cold and damp.

Gelsemium.—Painful urination and spasmodic retention of urine from cold; frequent desire to evacuate the bladder, with copious discharge of limpid urine.

Nux vomica.—Specially beneficial in those cases which are of gouty origin; frequent desire to urinate, though little urine is voided and its discharge is accompanied with much burning; violent straining when urinating; urine pale, containing thick white mucus or purulent matter.

Terebinth.—Congestion of the urinary organs; strangury; urine bright-colored or bloody; scanty; black, like coffee; turbid, with a thick, dark sediment; burning in the region of the bladder, with violent dragging, cutting and burning pains; tenesmus of the bladder; pressure in the bladder extending to the kidneys, disappearing on walking.

Vesicaria communis.—The acute cystitis calling for this drug is attended by a slight rise in temperature, extreme irritability of the bladder; sensation of weight and pain in the hypogastrium, increased by motion or pressure; pain may extend to the iliac or sacro-lumbar regions; the urine is voided drop by drop accompanied by straining and scalding; the urine is high-colored; cloudy, containing mucus, pus, blood and shreds of lymph.

Chronic Cystitis.—**Etiology.**—Chronic cystitis is always secondary to some other diseased condition. It may be the sequel of an acute cystitis a stricture of the urethra, growths of various kinds, which, by contiguity of tissue, interfere with the normal exit of the urine; pyelitis, nephritis, pyelo-

nephritis, etc. It may be excited by sexual excesses, stone in the bladder or retention of urine. The most frequent cause, however, is the entrance of bacteria into the bladder by means of unclean instruments or infection through the urine by the bacilli coli communi. Intemperance and individual idiosyncrasies often modify the disease. Acute or subacute attacks may at any time be engrafted on a chronic condition from cold, exposure, instrumentation, etc.

Pathological Anatomy.—The disease usually commences in the mucous membrane of the neck and fundus of the bladder, the inflammation in the severe forms soon involving the muscular and serous coats. Sometimes in chronic cystitis the mucous membrane becomes pale; it may present no marked pathological changes to the eye when examined with the cystoscope during life or at the autopsy.

The mucous membrane, however, is generally swollen, congested and less firm than normal, with irregular areas of extravasated blood, producing purple or brownish blotches on the mucous membrane. The vessels are enlarged and varicose, filled with dark blood, with here and there erosions, ulcerations, granulations and villousities of the mucous coat, its surface being covered with glairy mucus or a chocolate-colored fluid, composed of broken-down cells, ammoniacomagnesium phosphates, etc.

The ureters leading into the bladder may be inflamed, dilated, and contain much pus, which may sometimes completely occlude them. The pelvis of the kidney and the kidney tissue itself may present evidences of inflammation and of compression from retained urine.

The cellular tissue of the vesical wall is often infiltrated with inflammatory products that undergo retrograde metamorphosis and finally breaks down forming circumscribed collections of pus, or the mucous membrane may become ulcerated and expose the muscular coat. The muscular coat

may be hypertrophied, with or without accompanying bladder dilatation. Sometimes contraction of the viscus occurs, due especially to the irritation of an acid urine, but usually it is dilated from atony. The muscular coat over small areas of the bladder wall may become atrophied and pouched, the walls of the sacculations being composed of the mucous and serous coats only; when the disease is of long standing all the coats of the bladder often become dilated and thinned, and the cavity sacculated; some of the sacculi may contain from two to eight pints of alkaline, fetid, chocolate-colored urine. The muscular coat may, on the other hand, be of a deep bluish-red or purple color, and stand out like large bands or cords. These inflamed bands are sometimes eaten through and divided by ulceration, and project as stumpy masses into the cavity of the bladder. Again ulceration may take place between the muscular bands, and perforation into the peritoneum and adjacent parts results. Partial or complete exfoliation of the mucous membrane from trauma sometimes happens. Membranous cystitis and diphtheritic cystitis are not known. Large abscess formations are uncommon, though small abscesses in the mucous membrane may occur.

Clinical History.—This varies greatly with the source and duration of the disease, the exciting cause governing not only the severity of the malady, but also the persistence of the clinical manifestations, which vary from a moderate disorder presenting increased frequency of micturition, slight uneasiness and burning during the act, with an uncomfortable feeling referred to the supra-pubic region, to one in which the desire to urinate is constant and is attended with the most agonizing burning pains and tenesmus.

The urine becomes chocolate-colored and of a pungent ammoniacal odor in the advanced state of the disease, micturition being frequent and agonizing, especially towards the end of the act, with pain referred to the sacrum, lower part

of the abdomen, penis, back and thighs. If atony and **dilatation** are present to any extent, the tenesmus will increase in violence and there will be dribbling of the urine from **overflow**, the quantity passed at each urination being only the **excess** accumulated between the acts. The over-distended bladder sometimes extends as high up as the umbilicus.

The associated diseased condition of the kidney often prevents the proper elimination of urea, which, as well as the introduction into the system through the diseased bladder of bacteria and their ptomaines, impair the general health. This systemic toxæmia is recognized by the great prostration, emaciation, weakness, thirst, hectic fever, restlessness, constipation, or occasionally diarrhoea, and, sometimes by a low or typhoid state, with dry tongue, irritable stomach, uriferous breath, delirium and coma.

The urine in cystitis may be acid or alkaline in reaction. In acid cystitis the subjective symptoms are slight and the urine contains only a small amount of pus. The vesical inflammation is usually mild unless tubercular. Acid cystitis is a frequent concomitant of prostatic hypertrophy. When due to this cause it cannot be cured without the removal of the prostatic obstruction, but it may be relieved by the indicated homœopathic remedy and properly directed systematic local treatment. The dangers connected with chronic acid cystitis are the development, both from the neglect and employment of local methods of treatment, of a pyelo-nephritis or an ammoniacal cystitis.

Chronic cystitis of seven years' duration, in which gonococci were found in large numbers in the urine, and a pure culture obtained, has been reported by Young. From his observations he believes the gonococci, when present in large numbers, have an alkalinizing effect on the urine.

Malarial cystitis is reported by Burart. The blood contained the plasmodia. Quinine cured the symptoms, which

were aggravated every other day at noon. The urine was loaded with pus; there was pain, vesical tenesmus, painful micturition, etc., with slight rise of temperature.

The character of the urine varies with the duration of the disease, the pathological conditions and the micro-organisms present, the bacilli coli communi being the most frequent, the staphylococci next and the micrococcus urea less common.

The urine is generally turbid or milky, and contains pus, albumen and epithelium. It rarely contains blood unless the condition is caused by tuberculosis, stone or cancer.

When the cystitis is due to urinary obstruction, the urea contained in the residual urine gradually decomposes into carbonate of ammonia, which attacks the mucous membrane and adds still further to the existing pathological changes. The ammoniacal decomposition causes the retained urine to become alkaline in reaction, and, as it is constantly in excess, it neutralizes the acid urine as it flows from the ureters. The pus and mucus which result from the catarrhal inflammation are converted into a yellow, stringy, tenacious mass, which may be drawn out into long strings.

Chronic alkaline cystitis is always of serious import; the symptoms are well pronounced and often difficult to control.

Interstitial Cystitis.—In this variety of cystitis the walls become greatly thickened, and circumscribed suppurative areas are not infrequent. The cavity of the bladder may become practically obliterated. The bladder, when examined bimanually through the rectum and over the supra-pubic region, often feels like a smooth wooden ball. This condition produces not only the ordinary symptoms of cystitis, but a varying degree of incontinence. This disorder is incurable.

Cystitis Faveolata.—When, on cystoscopic examination, the interior of the bladder presents a honey-combed appearance, the name cystitis faveolata is applied. It is due to extension of the inflammation to the deeper tissues of the ves-

ical wall, with a resulting weakening of the muscle coats, which give way under repeated pressure, and numerous recesses have resulted (honeycomb). In these recesses the urine stagnates, and pus, epithelium, triple phosphates, bacteria, etc., with ammoniacal decomposition, furnish material for continued and severe cystitis. This condition may occur in middle or advanced life and with or without urinary obstruction. The characteristic clinical symptoms are frequent micturition, which is increased by standing, exercise and jolting, with paroxysms of pain during and after the act. The urine is ammoniacal, micturition terminating in the discharge of a thick, sticky, gray mass. Residual urine may be present even without urinary obstruction.

Diagnosis.—From the clinical history it would seem that it would be impossible to mistake a case of cystitis, and this is particularly true of the severe chronic alkaline varieties due to stone, tumor, etc., yet there are many ills where the urine is acid or alkaline in reaction, perhaps presenting the three characteristic symptoms of cystitis, *e. g.*, painful, frequent, purulent urination, which are not in any sense to be classified as cystitis. In cystitis the urine is always purulent, and, when it is ammoniacal, there is always some cystitis, though there may be an accompanying pyelitis. When the urine is purulent and acid, pyelitis must be suspected. Pus in a urine, otherwise normal, if not due to urinary retention, vesical calculus, tuberculosis or a growth, is due to prostatitis or pyelitis, and not to cystitis. Pus may be present in the urine for an indefinite period, and may not be due to cystitis. While the microscopic examination of the urine will readily differentiate by means of the exfoliated epithelium the location of the diseased condition, if the disease is confined to one location a diagnosis may be made in the following manner without recourse to that method: A catheter is introduced into the bladder and the urine allowed to flow out; the

viscus is then washed clean with a warm saturated aqueous Boric acid solution, after which the urethra should also be douched. At the end of an hour, if the patient is again catheterized, and if the urine obtained contains a less percentage of pus than before, the case is one of cystitis; if it equals in amount the average percentage, it is undoubtedly of kidney origin. The purulent matter in a specimen of urine will, after settling at the bottom of a glass beaker, form a compact level base, if from the kidney; if from the bladder, it forms a billowy, fluffy deposit, and often does not fully sink to the bottom of the receptacle. Pyuria of renal origin is often remittent in character.

Prognosis.—Chronic cystitis due to urinary obstruction is generally cured by the removal of the impediment. It is sometimes even curable without removal of the cause, though there is always danger of a relapse. Cystitis in itself does not endanger life until such a time as the ascending inflammation attacks the kidneys. Often, especially in the chronic, alkaline variety, the physician must be satisfied to hold the disease in check. Cystitis of recent origin is quite readily curable; when long-standing a cure is impossible unless the cause of the inflammation is removed.

Treatment.—This, to be effectual, must not only be intelligently directed, but systematically conducted. The first essential in the treatment of chronic cystitis is the removal, if possible, of the cause. All urethral obstructions must be treated surgically. Anything which tends to produce congestion of the bladder walls directly or indirectly must receive attention. The bladder should be emptied regularly to avoid over-distension. The action of the bowels must be carefully regulated, as constipation, by interfering with the exit of the bacilli coli communi, permits of an increase in their number in the intestinal canal and the liability of their passing into the bladder.

If exercise, diet and the homœopathic remedy *do not* regulate the daily evacuation of the bowels, enemata of normal salt solution, or the ingestion of a sufficient quantity of Hunyadi, or Carabana water, or some other mild saline *may* be required.

The diet must be non-stimulating and easy of digestion. Alcohol must be interdicted. Out-of-door employment, according to the strength of the individual, is to be recommended; the hours of sleep must be regulated and properly observed. Carriage riding and walking are usually beneficial, but must not be carried to the point of producing fatigue. A hot or cold sponge bath should be taken every morning, followed by vigorous rubbing with a coarse bath towel. Turkish baths should be taken once a week. Flannel underclothing should at all times be worn, and fatigue and exposure avoided.

Diuretics and demulcents, of the natural mineral waters, are of great benefit. For general use, Poland or Peperill will be satisfactory; for the gouty or rheumatic, Lithia water; for the anæmic, or when there is an associated diarrhœa, one of the ferruginous or ferro-arsenical varieties. The daily amount of the water ingested should be sufficient to keep the specific gravity of the urine below 1015. If the urine is over-acid, saline diuretics, such as Potassium citrate in from five to ten grain doses, well diluted in water, may keep it neutral and bland.

Triticum repens in the infusion often gives quick relief to the harassing strangury. Urotropin, Cystogen, Helmatol and Aminoform, are non-toxic and non-irritating; under their influence in chronic cystitis the ammoniacal odor of the urine soon disappears, the acidity returns, the triple phosphates and urates of ammonium crystals cease to form and a large percentage of the pus corpuscles disappear. Urotropin does not kill the micro-organisms and spores in the urine; it

merely inhibits their development. Urotropin should be administered after meals in from seven and a half to fifteen grain doses dissolved in three ounces of water. Cystogen should be given in five grain doses. Urotropin, while acknowledged to be the best urinary antiseptic known, is not infallible. Sometimes Boric acid or Salol will be found to act much better, the former in five grain doses and the latter in three grain doses, before meals. The dose of Urotropin must never be sufficient to irritate the neck of the bladder, though sometimes this action, which is also exerted upon the kidneys, is beneficial in producing an increased flow of urine. If the urine is alkaline, and offensive, Benzoic acid, Sodium or Ammonium benzoate, in ten grain doses, six times a day, acts well. Mucus in the urine often disappears during the administration of grain doses of Terebene in capsules, or five drop doses of Oil of Eucalyptus and Cubebs three times a day. Local treatment in the form of instillations into, or irrigations of, the vesical cavity are often beneficial. Instillations are particularly efficacious in the recent cases and should be applied with Bang's syringe sound, or through a catheter cut nine inches in length, so that the eye when it is fully introduced will enter the neck of the bladder, the selected medicinal fluid being injected with the Taylor syringe. Nitrate of silver, in solution from 1-1000 to 1-20, is used almost universally, except in tubercular conditions, where it is especially contra-indicated. Irritation of the bladder and the frequent calls to urinate may be palliated by the instillation into the deep urethra of a few drops of a 4 per cent. solution of Cocaine.

Irrigations of the bladder are often necessary in the chronic cases. The douches should be used at a temperature of 90° to 100° F. Satisfactory results may be obtained by irrigating the bladder by means of the Valentine hydrostatic pressure instrument without the catheter, through a Marcy double current catheter connected with a fountain syringe, or by Skene's ap-

paratus, which consists of a soft rubber catheter joined to a piece of soft rubber tubing by means of a small glass tube, the whole being about two feet long, a small funnel inserted into the end of the tubing completing the apparatus. *It is* used as an elongated catheter to empty the bladder of the urine, after which the washing out is accomplished by *pouring* the selected medicated solution into the funnel, which is raised high enough to allow it to flow by gravity into the bladder, the funnel afterwards being lowered in order to permit the fluid to escape. This process is repeated as often as necessary, using any desired quantity and pressure, or, after the catheter has been properly introduced, the bladder can be distended with the selected fluid with the syringe, allowing the solution to escape while refilling the syringe. When ready for the operation the catheter should be introduced and the urine evacuated. The douching should be continued until the fluid comes away clear. Some of the fluid should be left in the bladder after the first few washings, the quantity being gradually reduced each time.

Sometimes vesical douches produce great pain and distress, often of sufficient intensity to contra-indicate their use. The bladder should never be over-distended sufficiently to cause pain. As a rule, it is best to commence with a warm, normal salt solution, or a saturated aqueous solution of Boric acid. These are entirely unirritating in character and can with safety be employed by the patient. They are slightly aseptic in character. Thiersch's solution, or one of Salicylic acid, one-half grain to the ounce of warm water, is readily and quickly prepared by dissolving eight grains of Salicylic acid in one ounce of alcohol and adding this to a pint of hot sterilized water. Aqueous Hydrastis, a teaspoonful to the quart of warm water, is very satisfactory. Great care should be taken to keep the catheter aseptic and to lubricate it before introduction with Lubrichondrin.

In chronic vesical disorders, the bladder often does not at first tolerate liquids of low specific gravity, hence it is sometimes necessary to increase the density of the bladder douches.

Dr. Gouley recommends the following :

R Hydrarg. chlor. corr.,	gr. v.
Ammonii chlor.,	gr. xx.
Spts. gaultheriæ,	fl. ʒ ss.
Acid boracic,	ʒi.
Glycerinum,	fl. ʒ viii.

M.

Sig. To one-half fluid ounce of this solution add seven fluid ounces of warm water (110° F.) and two and one-half fluid ounces of Hydrogen peroxide. This ten-ounce solution is sufficient for four washings. It is unwise to repeat irrigations too frequently.

In bladder irrigations, soft water must always be used as the diluent ; hard water chaps the interior of the bladder and produces unpleasant complications. After the viscus has become accustomed to irrigation, a warm aqueous solution of Nitrate of silver, 1-24,000 to 1-16,000, may be employed, though it sometimes produces excessive pain, the strength being increased as seems advisable by the subsidence of the general symptoms, diminution of the quantity of pus in the urine, and the daily number of calls to urinate, but any increase in pain or the quantity of pus in the urine is a warning to diminish the frequency of the irrigations and the strength of the silver solution. Sometimes the bladder douches can to advantage be increased to a strength of 1-1000, though 1-6000 is the usual strength. Bladder douches of Borolyptol, one part to ten of water; a 0.5 per cent. aqueous solution of Protargol; a 5 per cent. Argyrol; Bichloride of mercury, 1-1000 to 1-40,000; Permanganate of potash, 1-400 to 1-2000; Pixcresol, 1-100 to 1-1000, or Creolin, 1-1000, in the order given may be beneficial. When the bladder is septic, a final irrigation of a 1-3000 aqueous solution of Silver lactate should be given.

Pyoktanin (the blue variety) has been beneficial in chronic cystitis. From two to six applications are reported to have cured in several cases. It is employed as follows: The bladder having been emptied by catheterization and douched until the excess of mucus and pus have been removed, two drachms of a saturated solution of Pyoktanin is injected into the vesical cavity, followed by an ounce of sterile water; this is allowed to remain one minute, after which the bladder is douched with sterile water until the flow returns clear. The application may be repeated every ten days. The pain excited is often severe and may require the administration of grain doses of Codein for its relief.

When there is a great amount of mucus or muco-pus in the bladder, which cannot be easily removed, Dr. Pugh advises the injection into the bladder of six ounces of a saturated aqueous solution of Boric acid, and before this is evacuated from the bladder the injection of a strong solution of Bicarbonate of soda. This results in effervescence, cleansing and removal of all the pus in the bladder. The mixture must be evacuated in about a minute, or pain from over-distension will result. The bladder should then be irrigated with sterile water and the selected blenorrhagic solution, such as Boro-glyceride, two drachms to four ounces of water; Iodoform, ten grains to one ounce of water with a sufficient quantity of Mucilage of acacia to keep it in suspension, or a solution composed of Kennedy's White pinus canadensis, four drachms; Listerine, one ounce; water, eight ounces, injected and allowed to remain.

Freudenburg has been very successful in treating alkaline cystitis with intravesical injection. After the usual bladder lavage with a warm saturated aqueous solution of Boric acid, he injects into, and allows to remain in the bladder, three cubic centimeters of an emulsion composed of Iodoform, one part and glycerine ten parts, mixed with thirty or forty cubic centi-

metres of an aqueous solution of Boric acid. This changes the reaction of the urine from alkaline to acid, after which silver solutions are beneficial. The Iodoform modifies the urine and the silver acts on the mucous membrane. When the urine is alkaline and there is an excess of mucus in the bladder, with a tendency to the deposit of phosphates and the formation of calculi, this condition may be corrected by daily bladder irrigation with a solution of Citric acid, five to ten grains to the quart of warm water.

When irrigating the bladder the end of the catheter must not be allowed to project too far into the cavity of the organ as it may come into contact with the collapsing wall, throwing it into spasm by the irritation it produces. The gross vesical impurities are best removed when the bladder contains only a small amount of fluid, but to cleanse the viscus thoroughly it should be sufficiently filled to smooth out all its folds and pouches.

To wash the bladder cavity and free it from extraneous matter, about three ounces of the selected fluid should be injected rapidly with a sterilized hand syringe. This fluid should be evacuated through a catheter before the injection is repeated. The rapid introduction of the fluid excites eddies and sets the contained pus, mucus, clots, etc., into a whirl. When distension of the bladder wall is desired, to bring the solution into contact with the entire mucous membrane, hydrostatic methods of irrigation are preferable. Momentary smarting may follow the injection owing to the sudden and irregular distension of the bladder. The douching should be continued until the washing fluid comes away clear. External manipulation must be avoided during the process of irrigation and care taken not to over-distend the bladder.

No exact rules as to the frequency of the bladder douches can be given. They must be administered to suit the individual, from two daily to one a week. If the douches fail to

give relief or produce too much pain, continuous **urethral** catheterization or perineal or supra-pubic cystotomy and **per-**manent drainage may be required to give rest to the **bladder** and allow of proper local treatment.

The following are the most useful homœopathic remedies and their principal indications :

Benzoic acid.—Urine high-colored, strong-smelling, cadaverous, specific gravity higher from the increase in volume of uric acid; urine often contains mucus and pus. This drug acts especially well in gouty subjects who are annoyed by *in-*continence of retention, as well as in those suffering from loss of power of the bladder walls by the highly concentrated urine. Dribbling is continuous, often accompanied by frequent calls to urinate with much tenesmus.

Chimaphilla umbellata.—Urine high-colored, bloody, with a greenish sediment, or large quantities of ropy, slimy, foetid mucus. No other remedy is so frequently indicated for chronic cystitis. The calls to urinate are frequent and may or may not be accompanied by vesical tenesmus; often there is inability to urinate except when standing with the feet well separated. Another symptom which is characteristic is a sensation of swelling in the perineum, or as though a ball had been forced into the anus.

Copaiva.—Urine greenish, turbid, bloody; smells like violets; contains yellow mucus. This remedy is often useful in cystitis of gonorrhœal origin where micturition is accompanied by much vesical tenesmus.

Dulcamara.—Urine viscid; turbid, whitish; sediment thick, stringy, composed of mucus of offensive odor.

Eucalyptus.—Urine scanty, foul-smelling, and contains a large amount of muco-purulent sediment; micturition is accompanied by much burning and smarting, together with general malaise and fever. Its sphere of usefulness is especially found in the urinary fever accompanying chronic cystitis, with afternoon chill, hectic fever and night sweats.

Nitric acid.—Urine ammoniacal with white sediment. Urine cold when voided. This remedy is especially useful in the cystitis and incontinence of old men, having the peculiar symptoms of intense urging to micturate immediately after the act, with shuddering along the spine.

Berberis vulgaris.—Urine yellow or red with a bran-like sediment, often of a greenish cast, containing a transparent, gelatinous sediment, or a copious clay-colored flocculent mucous deposit. Micturition is increased in frequency, with burning before and during the act. Violent constrictive pains in the bladder whether full or empty. Violent stitching, tearing, burning pains in the region of the kidney, extending forward along the course of the ureters into the bladder, and down the posterior part of the pelvis, aggravated when stooping, lying or sitting, relieved by standing.

Pareira brava.—Urine ammoniacal, containing thick, viscid mucus; micturition accompanied with great burning and violent straining, associated with pain extending into the glans penis down the thighs and even into the feet. This pain is often so agonizing that the urination is only possible when on the knees and the head pressed against the floor.

Populus tremuloides.—Weight, pressure and aching in the pelvis, with vesical tenesmus and frequent calls to micturate. Little pain during micturation, but at the end of the aching a severe cramp-like pain just behind the pelvis, lasting ten to fifteen minutes. This remedy is particularly useful in the cystitis of elderly men.

Pulsatilla.—Urine red in color, sediment jelly-like and slimy, often adhering to the vessel. Frequent almost ineffectual urging to micturate; constant pressure and desire to urinate. Pain in the bladder extending to the pelvis and thighs. Urinary retention with heat and soreness in the vesical region. Involuntary discharge of urine drop by drop at night on walking or coughing. Urinary stream intermittent; constrictive pains in the bladder at the end of micturition.

Sabal serrulata.—Frequent calls to urinate; micturition unsatisfactory; urine voided in drops accompanied by extreme tenesmus. Incontinence of retention. The cystitis which is relieved by Sabal has an accompanying symptom, muscular jumping of the body on lying down to sleep, which often awakens the patient. The cystitis, which is relieved by Sandalwood, has an accompanying dull, heavy pain across the lower part of the lumbar region.

Sulphur.—Urine high-colored, turbid, excoriating, often of a penetrating odor, with a thick deposit that adheres to the chamber. Urine is often increased in quantity. The desire to micturate is sudden and imperative; if not at once gratified the urine will be voided involuntarily. Frequent calls to urinate, especially at night, with a feeling of obstruction at the neck of the bladder and a sensation of pressure and distension. Bruised sensation in the small of the back after urination.

Thuja occidentalis. Urine clear when voided, but becomes cloudy on standing; frequent calls to micturate during the night; urging to urinate; the stream is often interrupted. Stitch-like pain from the rectum to the bladder, and from the bladder to the urethra. Incontinence from paralysis of the internal sphincter as well as the incontinence of retention.

Tubercular Cystitis.—**Etiology.**—As the initial lesion of a tubercular invasion of the bladder is very often obscure, the early symptomatic and diagnostic consideration requires accurate observation, together with confirmation by careful urinary analysis and bacteriological examination. Bacilli from tubercular foci in remote parts of the body, having entered the blood or lymph channels, may be carried to the kidneys, where, escaping with the urine through the kidneys and ureters, they pass into the bladder; they may also be introduced into the bladder by unclean catheters, instruments, etc. If the vesical mucous membrane is healthy it will not

necessarily be infected. Tuberculosis of the kidney may exist for years without associated vesical inflammation, although the urine voided may constantly contain pus, caseous matter, bacteria, etc., though, after years of immunity, the bacillus may engraft itself upon a congested vesical area inaugurated by some ill-advised instrumentation. Furthermore, an unhealthy condition may so weaken the normal resistance of the bladder epithelium to the action of the tubercular bacillus that infection may easily occur. Tubercular bladder inflammations have disappeared after the removal of a tubercular kidney without special treatment having been directed to the bladder.

With the possible exception of the ureters, tuberculosis may be a primary lesion in any portion of the urogenital tract, particularly at the base of the bladder, in the prostate, the epididymis or in the kidney. When a tubercular cystitis is secondary in character, the prostate, seminal vesicles, kidneys and epididymis are usually involved. Secondary tubercular cystitis often complicates general tuberculosis as well as tuberculosis of the prostate and seminal vesicles.

Pathological Anatomy.—The lesions presented in this condition vary with their period of existence. Following the initial inflammation there is infiltration of the mucous and sub-mucous tissues and the formation of miliary tubercles, which, like those elsewhere, are composed of round cells, a few giant cells and some tubercular bacilli. The tubercles, appear as minute, whitish areas, about the size of a pin-head, surrounded by an area of congestion. The intervening mucous membrane is red, swollen and velvety. The tubercular deposit occurs first in the sub-epithelial tissue. If the infection has descended from the kidney, the lesion may be confined to the neighborhood of the corresponding ureteral orifice. If it originates in the prostate, the lesion will appear upon the trigone. When primarily attacking the bladder it

may happen at any point or over irregular areas of the bladder wall (Fig. 113). The degree of infiltration between the tubercles varies; it may be quite extensive. As the disease progresses the tubercles undergo caseous degeneration with accompanying destruction of tissue and the formation of tuberculous ulcers. These ulcers usually have a rounded outline, the base being shaggy, and of a dirty yellow color.



FIG 113.—Tuberculosis of the Bladder. (Orth.)

They are usually shallow and rarely become more than three-quarters of an inch in diameter. The muscular wall, while often exposed by the ulcerative process, is rarely involved, hence perforation is uncommon. The bases and edges of the ulcers are composed of indurated, tubercular tissue. Sometimes they become incrustated with urinary salts.

Clinical History.—Increased frequency in the calls to micturate, due to the congestion of the inner layer of the

bladder wall, is generally the first symptom. As the disease progresses the desire to urinate increases and in time it may become almost incessant. It is generally most pronounced after meals and at night, though there are many exceptions.

The increased frequency of micturition is often accompanied by pain which is referred to the perineal region or the middle of the penis. Often there is a deep, dull pain behind the scrotum or in the supra-pubic region, increased by over-distension of the bladder and relieved by evacuating the urine. These locations of pain have marked diagnostic significance. There may also be pain before, during and after the act. When the neck of the bladder or the prostate is involved, retention of urine may be an early symptom. As the ulcerative stage advances and the deeper structures of the bladder wall and prostate become affected, incontinence of urinary retention may occur. At first the quantity of urine voided is increased, it may be apparently normal, clear and pale or slightly tinged with blood. If cystitis develops the pain in the bladder may become severe and agonizing. If, from any cause, clots of blood and purulent matter become lodged in the urethra tenesmus will occur.

Hæmaturia is also an early manifestation; it may be the earliest symptom. The amount of blood varies greatly, there being at first only a drop or two at the end of micturition or only sufficient oozing from the rents in the congested blood vessels of the mucous membrane to tinge the urine and give it a rose-red or pinkish appearance. The last few drops of the urine voided may be quite bloody, the urine being squeezed from the neck of the bladder (terminal hæmaturia). Occasionally the hæmorrhage is profuse, owing to the rupture of a large vessel. The bleeding may be constant or interrupted; it may disappear for a long period and return again without apparent cause or after some slight exertion, though generally it is not influenced by motion, railway rides, jars, etc.

When pyuria occurs, if the urinary reaction continues acid, the urine will be slightly dimmed, but when, from associated cystitis, it becomes alkaline, the urine will appear dark and very cloudy. The color depends upon the quantity of blood present and will vary from a slight pink to a deep red or brown. The urine may contain clots and small pieces of necrosed tissue with gritty particles, leucocytes and blood cells as well as uric acid, urates and oxalates. Epithelial cells from the bladder and the pelvis of the kidneys together with renal casts are often present in the urine.

So long as the mucous membrane only is the seat of a simple inflammation, the urine remains acid in reaction; when the tubercular process has advanced to ulceration, pus appears in the urine, producing a slightly dimmed or hazy appearance, though it may still continue to give an acid reaction. This acid reaction is characteristic of tubercular cystitis. In doubtful cases, repeated microscopic and bacterial examinations should be made, and twelve hours before the urine to be examined is collected a vesical irrigation with a weak solution of Nitrate of silver should be given. This will aggravate the condition if it is of tubercular nature, and facilitate the early demonstration of the bacilli. Janet adds a little alcohol or ammonia to the suspected urine before using the centrifuge. This sometimes makes it possible to detect the bacilli in an almost clear specimen. König has pointed out that the staining properties of tubercular bacilli are diminished or entirely destroyed in alkaline or ammoniacal urine, so that in all doubtful cases of chronic cystitis which fail to respond to general treatment it is especially important to make a bacteriological examination, and to have a guinea pig or rabbit inoculated and examined to confirm the diagnosis. The family history should always be considered and the lungs examined.

As the fluid in a bladder invaded by a tubercular lesion is

usually cloudy and bloody, even when the organ has been repeatedly irrigated, the vision on cystoscopic examination will be obscured and the results obtained will rarely compensate for the discomfort at the time, to say nothing of the complications which may follow. Cystoscopic examination may be of value in showing the presence or absence of tubercular lesions. As a rule, examination with the sound, catheter, cystoscope, etc., is not advisable, as it causes severe pain, hæmorrhage, etc.

Diagnosis.—A tubercular origin should always be suspected when a cystitis, with increased frequency of micturition and slight hæmaturia, occurs in one between fifteen and twenty-five, particularly if the family history is tubercular and examination reveals nodules or other evidence of tubercular invasion in other organs of the body, or an undue vesical irritation is caused by a bladder douche of Nitrate of silver. Simple ulceration of the mucous membrane of the bladder presents many of the local symptoms of tubercular cystitis. It can sometimes only be differentiated by the family history and the fact that it is relieved or cured by bladder irrigations of Nitrate of silver. Fever, with its characteristic exacerbations, is rarely absent; with the onset of suppuration there may be distinct chills.

Tubercular cystitis presents a clinical picture similar to that of vesical calculus, but the tendency to frequent micturition in stone is relieved by rest, which does not obtain in tubercular cystitis; in vesical calculus, the reflex pain is referred to the glans penis in the male, while in vesical tuberculosis it seems to be located in the middle of the penis. When a tubercular condition of the kidney extends to and involves the bladder the clinical symptoms resemble closely those of renal calculus; when it extends from the seminal vesicles it simulates vesical calculus, with frequent desire to urinate, caused by a contracted vesical cavity, which in the

early stages will often not contain more than four ounces of urine. In the last stages of the disease the thickening of the walls of the bladder may be so marked that its capacity will be reduced to less than an ounce. Pain is relieved when the bladder is half full but aggravated by distension. The act of micturition may be followed by the passage of a few drops of blood.

Tumors of the bladder are differentiated by the great vesical irritability and increased desire to urinate which they produce. Contracture of the neck of the bladder has many symptoms in common with tuberculosis of the bladder and often can only be differentiated by the family or general history.

Prognosis.—Primary vesical tuberculosis, if recognized sufficiently early, is fairly amenable to treatment. When secondary to tubercular lesions elsewhere the prognosis will depend entirely upon the location and degree of the primary involvement.

Treatment.—Unless an extensive tubercular cystitis is present, instrumentation of all kinds, on account of the danger of awakening the mild and slumbering disease, with all its serious consequences and perhaps fatal termination is contra-indicated. Until pus appears in the urine the treatment must be general, hygienic, climatic and medical. The diet must be plain, nourishing and non-stimulating. Fat foods should be taken to the point of digestive tolerance, though bolting of food as well as over-eating must be interdicted. A dry, clear climate should be commended for residence; chilling of the body surface must always be avoided. The bladder must not be permitted to become over-distended or the urine over-acid or alkaline.

The homœopathic remedy, as symptomatically indicated may constitute the entire treatment. The late Dr. Martin Deschere cured many chronic cases with Calcarea or Baryta carb. and mur., Silicea mar. 30, and Tuberculin 100, and the acute and

subacute forms with Baryta or Calcarea iodide. As a rule, little but palliation can be expected. Urotropin must not be prescribed in tubercular conditions unless it is combined with Carbonate of creosote, as it produces irritation of the kidneys and polyuria. Guaiacol, in three to twenty-drop doses three times a day, or the same dose of Creosote given for a long period, has acted kindly. Iodoform, Ichthyol and Ichthalbin, administered in pill or capsule form, have been beneficial. Nuclein has many reported cures; four grammes should be taken daily. It has also been used in the advanced stages as a 50 per cent. intra-vesical injection.

When vesical irrigations to clear the bladder seem advisable the hydrostatic method should be employed and the solutions evacuated per urethra: Normal Salt or weak Salicylate of soda solutions are beneficial. Permanganate of potash and Boric acid are injurious.

When pyuria occurs some form of local treatment frequently will be necessary. Irrigations are generally contra-indicated. When employed extreme gentleness is essential, as roughness of any kind is badly borne. Hence instillations are favored, Bichloride of mercury, ten to forty drops of a 1-2000 solution, applied every two or three days being particularly beneficial.

Jarmin advises and reports cures by injection into the bladder of an emulsion composed of 5 per cent. Iodoform and Vaseline, one or two teaspoonfuls being injected every forty-eight hours. Picot recommends an emulsion composed of Guaiacol, five parts; Iodoform, one part; sterilized Olive oil, one hundred parts; of which ten to twenty drops are to be injected daily. Olive oil is to be preferred in making the emulsion, as Vaseline has been known to furnish the nucleus of a vesical calculus. Trichloride of iodine in 0.2 to 0.5 per cent. solution may be used.

Where an early diagnosis is possible, a supra-pubic cystotomy with curettement of the tubercular lesions, followed by

the application of Lactic acid, the Paquelin cautery, or Iodoform rubbed thoroughly into the diseased area, drainage instituted for a few weeks, with daily bladder irrigation, using a solution of Bichloride of mercury, 1-2000 to 1-20,000, or Borolyptol, one part to ten of warm water, is to be advocated. In severe tubercular cystitis, the entire bladder may be removed and the ureters implanted in the intestine or the rectum.

Irritability of the Bladder.—This condition is frequently associated with or caused by some perverted sexual habit, a concentrated condition of the urine, a gouty or strumous diathesis. It may be due to reflex irritation of a stone in the bladder, some prostatic disease, rectal, uterine, or ovarian lesions, tænia in the intestines, growths in the neighborhood of the urogenital tract, congenital or acquired contractions of the meatus urinarius, etc.

Clinical History.—Irritability of the bladder develops slowly. It may begin with an inflammatory process and disappear with the subsidence of the inflammation. It incites frequent desire to urinate, usually without burning, smarting or tenesmus. Micturition is not at all times satisfactory, and the desire to evacuate the bladder may reappear in a few minutes, especially if the patient is worried, mentally depressed, or is exposed to the influence of a damp, cold atmosphere. On the other hand, if pleasantly engaged or somewhat exhilarated by drink, hours may intervene without the least inconvenience or desire; sleep is not usually disturbed.

The urine may be voided slowly; sometimes there is a short wait before the act, caused by spasm of the muscles of the membranous urethra; at other times the stream will start with a spurt. The urine is generally acid in reaction, clear, free from pus, epithelium or mucus, and contains crystals of amorphous phosphates, urates and oxalates.

Erections may be frequent or absent, with some uneasiness

around the scrotum, and especially in the rectum ; possibly some irritation is experienced at night, and sometimes dull, dragging pains with disturbance of the bowels.

The passage of a full-sized bulbous bougie may give evidence of a spasmodic constriction in both the membranous and prostatic portions of the urethra. Its introduction may produce faintness, desire to urinate or a seminal emission. On removal, a trace of blood is sometimes noticed on the instrument ; its passage usually affords marked relief for a few days, although slight burning may accompany the next act of micturition.

Treatment.—The cause should, if possible, be removed, the general health and morale improved and outdoor employment recommended. The passage of a full-sized steel sound every fourth day is generally beneficial. Applications to the prostatic urethra, by means of the Bang's syringe sound, of two or three drops of a solution of Nitrate of silver, one to ten grains to the ounce of water, are sometimes beneficial. The condition, however, is often cured by the following remedies: *Nux vomica*, in the gouty and strumous ; *Belladonna*, *Ferrum aceticum* or *Ferrum phosphoricum*, if there is congestion ; *Rhus aromatica*, *Hyoscyamus*, *Buchu*, *Equisetum*, etc.

Urinary Incontinence.—This condition is of frequent occurrence and may result from many disorders ; it is a symptom and not a disease. Infants have practically no control over the sphincter vesicæ ; with them urinary incontinence is natural. Some children control the urine from the time the diaper is outgrown, but the majority suffer occasionally with enuresis until the fourth to the sixth year. It is of frequent occurrence in young children and women. It may be induced by a hearty meal late at night, the drinking of water before retiring, neglect on the part of the parent to see that the child urinated before going to bed, or be a reflex

from a narrow prepuce or the accumulation of smegma behind the glans penis. In children it may be caused by uric acid due to over-indulgence in sweetmeats.

Urinary incontinence is often the first symptom of **Bright's** disease ; it may be a symptom of stone in the bladder, worms in the rectum or vagina, or arise from spinal irritation, diminished activity in the vesico-spinal centre of the bladder, etc. Vesical chorea may be accompanied by other choreiform movements.

Nocturnal enuresis (the diurnal variety is very uncommon) is usually due to exaggerated action of the muscular coat of the bladder. The compressor urethræ being off guard, or having lost its tone, does not prevent the escape of the contents of the viscus. It is not necessarily continuous, and may be intermittent or occur only after exposure to cold or from fright. This condition is often of neurotic nature, occurring particularly in shy, overgrown youths. In the adult it is usually the result of retention of urine and consequent overflow. It may be due to want of tone in the muscular coat of the membranous urethra, or hypertrophy of the bladder, as well as to an irregular development of the prostate gland so that the bladder overflows when filled beyond a certain point.

Treatment.—The cause should, if possible, be removed, and hearty meals and drinking late in the evening avoided. The habits should be analyzed and, if necessary, rectified. Children afflicted with enuresis should be awakened and taken up during the night to urinate, and never be scolded or whipped and their bed room should be lighted to make the sleep less profound. When the urine is over-acid an alkali should be given ; if ammoniacal, Benzoic acid will be indicated. When due to the abundance of uric acid in the urine, sweets of all kinds, particularly candy, must be interdicted. Electricity in its various forms has been recommended, the latest being cauterization of the prostatic urethra with the Freuden-

berg-Bottini cauterizer. Nitrate of silver instillations into the prostatic urethra are often curative. When due to incontinence of retention, Tiemann's urinals (Figs. 54, 55 and 56) may be required. *Rhus aromatica*, *Equisetum*, *Belladonna*, *Pulsatilla*, *Cina*, *Ferrum picrate*, Mullein oil and *Petroselinum* should be administered as indicated.

Strangury or Vesical Tenesmus.—This occurs as a symptom in many acute diseases and consists of an uncontrollable, agonizing straining and contraction of the neck of the bladder; it may be either neuralgic or inflammatory in origin.

Treatment.—The electro-static current applied to the spine and hypogastrium, or deep urethral instillations of a 4 per cent. solution of Cocaine as well as a 1 per cent. solution of Nitrate of silver, have given immediate relief.

Urinary Retention.—Retention of urine, though classed as a disease, is only a symptom; it implies inability on the part of the patient to empty the bladder. It may be voluntary or involuntary. Voluntary urinary retention is often practiced by children at play and by young girls and women from inconvenience or procrastination; in time it produces atony of the bladder muscle and terminates in true retention. Involuntary urinary retention may be caused by congestion, acute inflammation or traumatism of the bladder walls, prostatic enlargement, stricture of the urethra, obstruction of the vesical opening of the urethra by a calculus, a blood clot, a new growth or any foreign body or by paralysis or incoördination of the bladder muscles.

Pathology.—When not immediately relieved acute overdistension of the bladder from retention of urine is followed by congestion and inflammation of its walls with extravasation of urine into and ultimate desquamation of the epithelium. This dissolution of continuity of the epithelial lining, which normally prevents urinary absorption, may allow bacteria and poisons present in the urine to enter into the circulation through

the exposed lymphatics and blood channels. Over-distension of the bladder by urine not only causes congestion of its walls and the prostate, but permits the backward flow of urine from the bladder through the ureters to the pelvis of the kidney involving these portions of the urinary tract in the congestive process and often induces polyuria and later anuria. Paralysis of the detrusor muscle of the bladder occurs to a varying degree, often to the extent of making the viscus absolutely flaccid when the urine is subsequently evacuated. If the over-distension is long-continued, the muscular fasciculi of the bladder may become paralyzed and a trabiculated condition result. The congestion often extends to the adjacent peritoneum and abdominal viscera.

Chronic retention of urine produces congestion of the bladder wall and renders it susceptible to bacterial infection. Generally in chronic urinary retention, there is an associated cystitis, produced by infection from without through careless instrumentation or from within by infection by the bacilli coli communi, etc.

Clinical History.—Urinary retention may develop suddenly or insiduously, and be complete or incomplete. Complete sudden retention causes pain in the region of the bladder accompanied by frequent unsuccessful agonizing attempts to micturate, which increase in severity until the urine is evacuated. The tenesmus is constant and harassing, with tenderness over the vesical region. If the retention is not relieved, a globular-shaped fluctuating tumor, dull on percussion, will fill the bladder region and sometimes extend as high as the umbilicus.

When the retention comes on insiduously, the bladder may become so slowly and painlessly over-distended that the condition is not even suspected until a physical examination reveals its existence. In this variety of urinary retention the earliest symptom is increased frequency in the calls to micturate, the urinary stream being diminished in volume and force.

Urinary retention from congestion or inflammation is generally the result of a gonorrhoeal invasion of the prostatic urethra, the development of a prostatic abscess, traumatism of the parts or the application to the urethral canal of an irritating injection, particularly when the urethra or prostate is damaged.

Retention of urine is the paramount symptom of prostatic hypertrophy. It may be due to a gradual increasing obstruction to the exit of the urine produced by the development of a collar-like band around the vesical neck, with elevation of the mouth of the urethra, which leaves a pouch in the bladder behind and below it; to obstruction to the exit by the overgrowth and projection backward into the bladder cavity of the so-called middle lobe; to the elongation of the prostatic urethra by the overgrowth of the lateral lobes of the prostate, or a narrowed and tortuous condition of the canal for the same reason, etc. Retention may also be produced by hypertrophy of the posterior muscular fasciculi of the prostatic urethra without enlargement of the prostate. Provided cystitis does not develop, urinary retention from prostatic obstruction, until the residual urine exceeds four to six ounces, produces practically no symptoms except a slightly increased frequency in the calls to micturate and the necessity of evacuating the bladder once during the night or early in the morning. In fact, urinary retention from prostatic hypertrophy may develop so insiduously that it entirely escapes the notice of the patient. As urinary retention increases, the bladder becomes greatly over-distended and may even reach to the umbilicus. The ureters and the pelves of the kidneys often become involved, and even changes in the kidneys result, causing polyuria and anuria, with accompanying and consequent gastro-intestinal disturbance. In urinary retention from prostatic hypertrophy, increased frequency of micturition develops in proportion to the dilatation of the bladder, the calls

being more frequent at night. The volume of the stream is diminished or even stopped by pressure; this condition finally terminates in the incontinence of urinary retention. When cystitis is added thereto the state of the patient is truly pitiable. The clinical history, the enlarged prostate, a tumor occupying the bladder region and often reaching to the umbilicus, the length of the urethra, which is increased to ten or eleven inches, and the residual urine obtained by catheterization immediately after micturition with disappearance of the tumor give a clear diagnostic picture.

In sudden complete or incomplete urinary retention resulting from obstruction of the internal opening of the urethra by blood clots, tumors, calculi, etc., the differential diagnosis will be greatly facilitated by the previous clinical history. When due to blood clots, there is generally a history of previous traumatism, hæmaturia, the passing of small clots, etc. Intermittent blocking of the urethral exit of the bladder by clots, which soften in a short time, is characteristic. Acute retention from vesical calculus usually presents a history of renal colic, frequent micturition and pain referred to the end of the penis. If a urethral steel sound is introduced the calculus may be dislodged with a grating noise, and the urine, immediately after its removal, can be voided as usual. Pedunculated growths have a history similar to blood clots; the introduction of a catheter to a point in which the eye is located beyond the obstruction gives a ready exit to the urine, which possibly may be free from blood.

Retention of the urine from paralysis or incoördination of the bladder muscles may occur even when the bladder and associated organs are free from local pathological defect. It may be caused by spasmodic closure of the sphincter vesicæ, follow a rectal or genito-urinary operation, fracture of some bone, or other traumatism, from a constipated condition of the bowels, or be due to shock, traumatism, hysteria, neuras-

thenia, peritonitis, exhausting diseases, etc. Urinary retention may in a degree be spasmodic, but usually it is due to muscular atony or deranged reflexes. It may be a symptom occurring in injury to the brain mass, paralysis, locomotor ataxia, Pott's disease, etc., or diminution of power of the detrusor bladder muscles, or loss of control of power of the sphincter.

Urinary retention due to urethral stricture will be suggested by the history of a previous gonorrhœa, a gleet discharge, an injury to the urethra or perineum, as well as the increased frequency in the calls to micturate during the day, with but little disturbance at night, the absence of prostatic enlargement and the presence of urethral narrowing, as demonstrated by the bulbous bougie. The immediate source of urinary retention is congestion and swelling of the obstructed canal due to excess in eating, drinking, exposure to atmospheric conditions, sexual excesses, etc.

Treatment.—If the urinary retention is due to acute prostatitis, and the prostate is hot, swollen and sensitive, hot general baths, hot rectal irrigations by means of the author's recto-prostatic irrigator, rectal suppositories containing extract of Opium, one grain, and extract of Belladonna, one-quarter of a grain, every two hours, and the indicated remedy will generally give relief. If the congestion is not allayed in a few hours catheterization must be employed. If the retention is due to congestion or spasm of the urethra, and the general measures recommended do not afford relief, catheterization will be essential. Etherization may be necessary, though local anæsthesia with 2 per cent. solution of Cocaine or Eucaïne will generally relieve the spasmodic condition and facilitate the introduction of the catheter.

When the urinary retention is symptomatic of a prostatic abscess, the pus sac must be opened by incision through the perineum and surgically dressed.

Treatment for urinary retention due to obstruction from blood clots will vary with the symptoms. If the patient is not in special pain, a hot bath, with the use of rectal suppositories containing extract of Opium, one grain, and extract of Belladonna, one-quarter of a grain, together with irrigation of the urethra with a warm aqueous Boric acid solution, may be all sufficient. If these fail, catheterization will be necessary. If the catheter becomes obstructed with blood clots it can be cleansed by the injection through the catheter of a drachm of a weak antiseptic solution or by suction with the author's modification of the Janet vesical syringe. If catheterization is impossible a supra-pubic cystotomy will be inevitable.

When the vesical mouth is plugged by a calculus, aspiration of the bladder may be indispensable. When an impassable urethral stricture is present, supra-pubic aspiration may also become necessary. Supra-pubic aspiration of the bladder can be repeated a number of times daily for a considerable period without causing complications. The greatest antiseptic precautions are, however, necessary. The instruments and hands of the operator must be rendered aseptic. The pubes must be shaved, scrubbed with green soap and hot water, then with the lime and soda preparation, and flushed with sterile water. After proper preparation the skin is punctured with a tenotome about one-half an inch above the symphysis pubis in the line of the linea alba, and the aspirating needle introduced into the bladder through the puncture in a downward and backward direction the urine evacuated on the lines already given. In withdrawing the needle, the suction of the aspirator must be continued or drops of the urine may be discharged into the needle tract and local infection, etc., if the urine is septic, may follow.

For the relief of retention due to calculus and tumors, the special chapters on these subjects should be consulted.

Acute urinary retention produced by paralysis or incoördi-

nation of the bladder muscle is often relieved by the administration of the indicated remedy, a copious rectal enema and a general warm bath, the patient urinating while in the bath. Irrigation of the urethra with a warm aqueous Boric acid solution is sometimes successful. If for any reason urethral irrigation is contra-indicated, a rectal suppository containing one-half grain of extract of Opium and one-quarter of a grain of extract of Belladonna may relieve the spasm and enable the patient to evacuate urine. If these fail, the catheter must be used. If the condition is chronic, as in Pott's and other chronic diseases, the same care must be observed as in retention due to prostatic enlargement.

In retention due to urethral stricture, the indicated remedy with a hot bath, a hot rectal enema, hot stupes to the perineum and supra-pubic regions, and an Opium and Belladonna rectal suppository may give relief; if they do not, instrumentation will be necessary. Urinary retention caused by a spasmodic stricture is often relieved by the introduction of a full-sized conical steel sound; if this fails, the rat-tailed flexible or the filiform retention catheter of Lohrstein may be successful; or a whalebone filiform guide, which allows the urine to slowly flow along its side, can be introduced and retained in situ. If these procedures all fail, a urethrotomy or supra-pubic cystotomy must be performed. Supra-pubic aspiration may give relief for the time being.

Complete urinary retention from prostatic obstruction invariably requires surgical attention. If it is incomplete, palliation may be instituted.

Catheterization.—This method for the relief of urinary retention when possible, is ideal. It must be performed under strict aseptic precautions or bacterial infection of the bladder may follow the immediate relief afforded. Before catheterization is commenced, the prepuce and glans penis of the patient, the hands of the operator, and the instruments to be used

must be cleansed and rendered aseptic, and sterilized towels placed about the penis. A No. 16 French soft rubber catheter (Fig. 114), previously lubricated with Lubraseptic, should be introduced into the urethra and the canal douched, through the catheter as it enters the urethra, with a warm saturated



FIG. 114.—Soft Rubber Catheter.

aqueous solution of Boric acid. If this catheter cannot be introduced by gentle pressure the following may be tried successively: A Mercier catheter with one (Fig. 115) or two elbows (Fig. 116); an English catheter (Figs. 117 and 118) with



FIG. 115.—Mercier One Elbow Catheter.

a long curve formed by its contained stylet, given any possible form by its contained catheter staff; an Olivary gum (Fig. 119) catheter; a silver catheter, with a Thompson (Fig. 120) or a long prostatic curve, or, when stricture of the



FIG. 116.—Mercier Two Elbow Catheter.

urethra complicates the condition, a Lohstein filiform retention catheter. Unless the urinary retention is of short duration or the amount of retained urine is less than twelve ounces, the bladder must not be completely evacuated at the first seance, because when the urinary retention is of long duration and the

ureters and the pelves of the kidneys are involved, even without accompanying infection, the sudden removal of the urine may cause renal or vesical hæmorrhage with subsequent complications. When infection is present, it may produce sup-



FIG. 117.—English Web Catheter.

pression of the urine with resulting uræmia and terminate fatally. When the quantity of urine retained exceeds twelve



FIG. 118.—English Web Catheter.

ounces, if it is sterile, a portion may be allowed to remain to be gradually reduced by subsequent catheterization. When



FIG. 119.—Olivary Gum Catheter.

the urine is septic, after the evacuation of one-half to two-thirds of its volume four to twelve ounces of a sterile saturated



FIG. 120.—A Silver Catheter.

aqueous solution of Boric acid, at the temperature of the body, should be injected into the bladder, allowed to mix with the urine and then be withdrawn; this should be repeated until the bladder contents return clear, when six to twelve ounces

of the solution should be allowed to remain in the bladder to be gradually evacuated by later instrumentation. Catheterization may be required from four to eight times daily. The bladder, after the first twenty-four hours, should never be allowed to contain at any one time more than twelve ounces of urine. Generally the catheter can be discontinued after a week or two, though it must not be discarded altogether until the urine can be voided without straining, discomfort, etc. Sometimes catheterization can never be discontinued until operative measures have relieved the prostatic obstruction.

When instrumentation is difficult, painful or produces much bleeding, when the urine is loaded with pus, is ammoniacal, etc., or when the general system is blunted by feverish conditions, continuous catheterization is sometimes necessary. It gives rest to the bladder and facilitates vesical douching, and is particularly serviceable in the acute exacerbations of chronic cystitis accompanying retention. While it does not produce a reduction of the prostatic obstruction it relieves the congestion and irritation of the parts. It is instituted as follows: The selected catheter, 18 to 22 F., which may be of the English woven type, or of soft rubber with one elbow or of the self-retaining type, is introduced, the eye of the catheter protruding about one-half an inch into the vesical cavity, the catheter being properly located from the effect produced upon the stream of urine by moving it forward and backward. Its location should be further tested by the injection into the bladder of four ounces of a warm saturated aqueous solution of Boric acid which should be completely returned, after which the urine should continue to drop from the end of the catheter. If the catheter is introduced too deeply into the bladder it excites vesical pain and uneasiness. A small safety pin passed at right angles through the catheter one-half inch in front of the meatus prevents it passing deeper into the bladder, and by threads connecting the pin to strips of adhesive plaster applied

to the sides of, or encircling, the penis, will prevent its escape from the urethra. The pin should be separated from the glans penis by a small piece of borated gauze wound around the catheter. The projecting end of the catheter and the penis must be enveloped in an antiseptic dressing. The penis must always be supported to prevent tension, pressure and irritation from the retained catheter. When it is desired to give the bladder complete rest, the catheter is coupled by a small piece of glass tubing to a rubber tube of sufficient length to reach under the leg of the patient, across the bed and down to the bottom of a bottle at the side of the bed. The bottle must be one-fourth full of a 10 per cent. solution of Carbolic acid, which inhibits putrefaction and prevents ascending infection, etc. If the urine should from any reason cease to flow the dressing should be rearranged. When the urine is aseptic and the bladder wall is in fair condition, or in the early stage of acute retention, the end of the catheter may be closed with an artery clip and the urine allowed to flow only at stated intervals. If the bladder contains pus or blood it should be irrigated a number of times daily with four ounces of a warm saturated aqueous solution of Boric acid, a portion of which should be allowed to remain to be evacuated with the next discharge of urine, to prevent mechanical urethritis, which often results, and may, if neglected, cause abscess of the urethra. The catheter used for continuous vesical drainage must be removed and sterilized every second day, and the urethral canal irrigated either with a warm saturated aqueous solution of Boric acid, Nitrate of silver, 1-8000, or Lloyd's Hydrastis, one drachm to two ounces of warm water, and the canal around the catheter flushed once or twice daily with one of the same solutions. About a pint of the selected solution should be injected through the catheter, which must be withdrawn sufficiently to allow the fluid to pass into the urethra and flow along the side of the catheter and escape at the meatus. Continuous

urethral drainage can often be continued to advantage from three to eighteen days, and during the night and a portion of the day for many more. When on account of mechanical irritation, etc., continuous catheterization is unsuccessful, a supra-pubic or perineal cystotomy may be required.

For treatment of incomplete retention from prostatic obstruction, and the care of the catheter, see treatment of prostatic hypertrophy.

In retention of urine complicated by urethral false routes, catheterization is facilitated by the use of Mercier's *invaginated* catheter. Gouley says it is successful in more than 95 per cent. of this class of cases. The instrument consists of two catheters. The first or female is a thin-walled, No. 10 English silver catheter, eleven inches long, very slightly curved at its distal end, having in its concavity about one-half inch from the point an oval eye five-eighths of an inch in length and three-sixteenths in breadth; extending from the vesical extremity of the eye is an inclined plane, which is lost in the floor of the opening at the distance of a quarter of an inch. This serves to tilt up the point of the enclosed male catheter. The male catheter is a flexible No. 7 English, eighteen inches in length, which fits loosely in the lumen of the female catheter. It must have a single eye one-eighth of an inch from the point. The male catheter is introduced into and as far as the eye of the female; the complete instrument being then introduced as far as the obstacle. The point of the metallic catheter engages itself in the false route; the male or soft catheter is then pushed forward, over-riding the false opening and enters the bladder; if no urine flows the eye of the soft catheter may be occluded by a clot of blood which can easily be removed by the injection of a little sterile water. The metal portion of the instrument can then be withdrawn and the soft rubber catheter left as long as required.

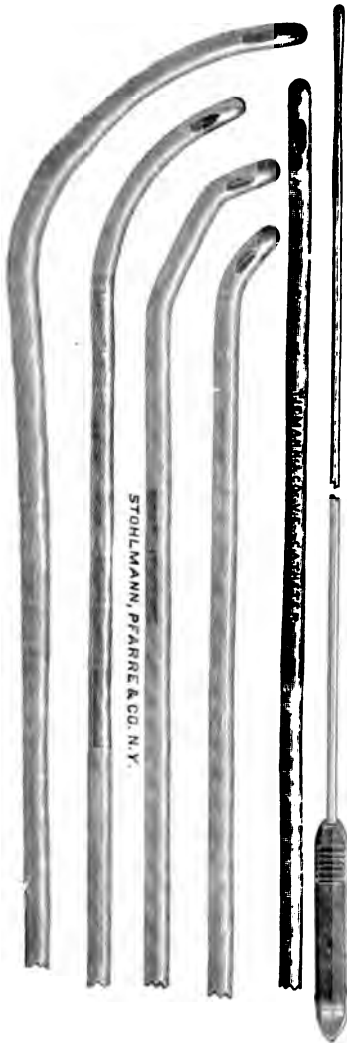


FIG. 121.—Catheter Staff and Forms Which May be Given to a Soft Rubber Catheter.

The author's catheter guide (Fig. 121) simplifies difficult catheterization. The staff is a semi-flexible stylet, six millimeters in circumference and thirteen and one-half inches in length, made of copper wire and silver-plated. When fully introduced into a No. 15 French soft rubber catheter (after being properly lubricated), and the end of the guide lodged in the end of the Tiemann velvet-eyed soft rubber catheter, the combined instrument may be moulded to any desired form—Mercier, Benique, Thompson or prostatic curve—as individually required. The combined instrument is then introduced, the urine flowing out through the catheter on removal of the staff, giving all the advantages of both the hard and soft instrument without any of their defects.

As web and soft rubber catheters are softened, injured and soon destroyed when lubricated with glycerine, vaselin, etc., where a proper lubricant cannot be procured the following mixture has proven satisfactory: White castile soap

(powdered), one ounce ; water, four ounces ; mucilage of *Chondrus crispus*, three ounces ; Formalin (40 per cent.), ten minims ; Thymol, five grains ; Oil of thyme, five minims ; Alcohol, fifteen minims.

When it is impossible to introduce a catheter, and it is necessary to repeat supra-pubic aspiration, perineal puncture, with the Harrison's trocar and canula, should be performed, the canula being left in place for bladder drainage for some days, after which time the urinary act is often restored.

In irritable conditions of the bladder, when the hypertrophied vesical wall is unable to overcome the resistance of the enlarged prostate and its strength is becoming impaired, and before true atony occurs, Arnica is often beneficial ; in the later stages, before true paralysis, Stramonium is helpful. When atony and cystitis have developed, Lycopodium, Cauticum, Nux vomica and Sulphur may be indicated.

TUMORS OF THE BLADDER.

Vesical Tumors.—Growths in the bladder wall may be benign or malignant ; they occur twice as often in men as in women. They usually commence as benign and later develop into malignant tumors. Primary malignant growths are uncommon, but the whole number of primary and secondary are much larger than the benign papillomata. From 25 to 40 per cent. of all vesical tumors are multiple. Tumors have, as associated or concomitant conditions, vesical thickening and infiltration of the wall of the bladder, hydro- and pyo-nephrosis, suppurative pyelo-nephritis, etc. Growths of the bladder are usually located in its lower half, showing preference first for the ureteral and then for the urethral opening. Deposits of the urine salts upon the growth sometimes produce a condition resembling a stone. Frequently a true vesical stone, usually of small size, complicates a bladder growth. Tumors of the bladder have a tendency to assume a mixed type, and

while their general history is similar they have characteristic differences, so that the pathological nature of each must receive consideration.

Papillomata appear generally between the thirtieth and fiftieth years. There may be one or many. They are located, as a rule, at the base of the bladder, though they sometimes develop about the trigone, in the ureteral regions, and sometimes in the posterior or lateral walls, but rarely elsewhere.



FIG. 122.—Papilloma of the Bladder.
(Thompson-Mitchell.)

They may be simple, multiple, branched, short, or long, slender, villous growths (Fig. 122), immersed in the urine, the long fimbriated growths floating out like slender leaved aquatic plants, which on removal collapse to form a soft mass; sometimes their extremities float or extend into the ureters or the urethra. These tumors vary from one-half to two inches in length, and may have a short pedicle, or be sessile in form, covering a large area. They may be coronoid in contour, the

red vascular edges resembling a cock's comb. They are reddish-gray in color and are easily fractured. They are composed of a connective tissue stroma, supporting a rich plexus of newly-formed blood vessels, covered by epithelium and simply attached to the mucous membrane.

Adenomata (Fig. 123) are rare. They are generally located near the neck of the bladder, and may extend into the urethra. They have occurred in young children. They grow rapidly and are soft in texture.

Mucous Polypi (Fig. 124) resemble polypi elsewhere. They may excite no symptoms whatever, though by continued growth they sometimes over-distend the bladder. When small they may give rise to symptoms simulating those of a calculus.



FIG. 123.—Adenoma of the Bladder. (Clado.)

Fibromata originate in the deeper tissues of the bladder wall, are covered by epithelium and may be sessile or pedunculated in contour. They occur only in the adult.

Myomata are rare.

Angeomata, **Serous** and **Dermoid Cysts**, have been reported, as well as fungoid growths produced by the *Bilharzia hæmatobia*.

Carcinoma as a primary lesion is exceeding rare, but as a secondary growth it is comparatively common. It appears as a hard, friable, rounded or irregular swelling on a broad, firmly-attached and infiltrated base, having a granular, villous or ulcerated surface and indurated margins; it is often encrusted with urinary salts. It is usually located at the base of the bladder or in the trigone; it develops rapidly, and causes death in from six to twelve months. It may commence or

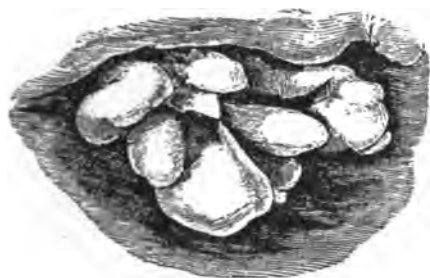


FIG. 124.—Polypi of the Bladder.
(Thompson-Mitchell.)

seem to be a papilloma (Fig. 122) until differentiated by microscopic examination. The latter variety constitutes what was formerly known as relapsing papillomata.

Sarcomata are uncommon; they generally appear before the fifth or after the fifty-fifth year.

They occur as hard sessile or pedunculated growths, varying greatly in size, with smooth, papillary or ulcerated surfaces.

Clinical History.—Sarcomata and myxomata occur principally before the fifth year, papillomata between the thirtieth and the fiftieth, and carcinomata between the fortieth and the sixtieth year. Symptoms of the bladder tumors may be quite in evidence, or they may remain in abeyance during life, the growth only being discovered at the autopsy. The most prominent symptoms are hæmaturia, pain, frequency of micturition and the presence of a tumor.

In vesical tumors the quantity of blood present in the urine (hæmaturia) varies greatly; it bears no relation whatever to the nature or size of the new growth, though it is usually most profuse when the tumefaction is of a villous character. In myomata and fibromata when the growth is covered with a

mucous membrane, hæmaturia is often absent. The hæmaturia may discontinue without apparent reason, be continuous or intermittent, the blood present giving the urine a pink,



FIG. 125.—A, Epitheliomatous Tumor; B, Wart-Like Growths; C, Villous Growths Around a Vesical Cell. (Clado.)

red, brown or black appearance ; clots in varying quantities are often present. The urine may vary in color during the same day from normal to a deep black, be clear or contain clots. The percentage of blood present in each special discharge of

bloody urine is greatest at the end of the act. Hæmaturia frequently disappears for weeks, months or years, though as the growth enlarges there is usually an associated increase of the bleeding. Profound anæmia, with all its associated symptoms, may result, and death occur from syncope.

DIFFERENTIAL TABLE OF HÆMATURIA (KEYES).

TUBERCLE.	STONE.	BLADDER TUMOR.	KIDNEY.
1. Slight and remittent at first.	1. Same.	1. Profuse and intermittent.	1.
2.	2.	2. Clots large.	2. Clots small, if any.
3. Blood bright or maroon.	3. Same.	3. Same.	3. Blood usually dark.
4. Little affected by exercise.	4. Brought on by exercise.	4. Little affected.	4.
5. May be produced by instrumentation.	5. Same.	5. Same.	5. Unaffected.
6. Associated with characteristic pain.	6. Same.	6. No pain at first.	6.

Pain is usually due to an associated cystitis; it is referred to the hypogastrium and the neck of the bladder; it may extend down the penis, scrotum, and thighs and is always most severe at the close of micturition. It usually precedes the hæmaturia for some weeks or months. It may be caused by a portion of the growth being caught in the sphincter vesicæ, the involvement of a nerve trunk in the inflammatory process, or to urinary retention and vesical over-distension due to clots obstructing the urethral neck of the bladder. Small as well as large clots, especially in an old or weakened bladder, may produce urinary retention, etc., though they are, as a rule, discharged after a little straining.

Frequency of micturition and straining sometimes occur, especially in malignant conditions involving the trigone. Urinary retention not infrequently is caused by a blood clot

or growths at or near the vesical neck, which by falling into the urethral opening closes the urinary exit of the bladder. The urine will, if there is an associated cystitis, appear whitish or opalescent and deposit a copious precipitate of pus, phosphates, clots of blood, shreds of mucous membrane and detritus. When the urine is albuminous from associated cystitis or nephritis the specific gravity will be lowered; if from the blood due to the growth, it will be increased. In either case the presence of albumen can be easily demonstrated by the usual tests. When it is the result of suppurative inflammation or is of renal origin, the serum albumen will exceed the globulin in the ratio of from twelve to eighteen to one; in hæmaturia of vesical origin the globulin will exceed the serum albumen in the ratio of from two and one-half to one to one-half to one. The pus, epithelial casts, urine salts and hyaline casts which are so often present in the urine are a product of the associated pyelitis and do not necessarily indicate a true nephritis.

The physical signs of a tumor may often be demonstrated by abdominal, vaginal or rectal examination, by the use of the cystoscope or the Thompson stone searcher. The initial examination must be made with the greatest of care and under strict antiseptic methods.

During the early period of vesical growths the general symptoms presented are mild in degree but as the associated cystitis appears the condition becomes not only serious but painful.

Diagnosis.—While induration or thickening of the bladder wall can be distinguished by digital recto-abdominal examination, papillomata and small vesical growths cannot be outlined. The diagnosis of bladder tumors in general depends upon the character of the hæmorrhage, the physical evidence of a tumor and the cystoscopic examination. It is sometimes difficult to differentiate vesical from renal hæmaturia, though

the presence of blood in the urine as it issues from the ureters indicates a ureteral or renal source. A tumor in the region of the kidney or the presence of blood clots shaped like pieces of angle worms in the urine, with associated renal colic, usually suggests a renal lesion, vesical clots being, as a rule, thick. Sometimes it is impossible from the clinical history to distinguish a benign from a malignant growth. Hæmaturia may be due to a varicose condition of the superficial veins on the mucous membrane of the bladder in the region of the trigone; in these cases the bleeding usually ceases after an exploratory cystotomy.

Prognosis.—Tumors of the bladder, if left to themselves, generally terminate fatally. Primary malignant growths develop slowly; benign growths may exist for years without greatly undermining the health, but they must always be considered of serious import. Secondary malignant growths do not give favorable results when operated. Some successful removals of primary malignant tumors have been reported. Papillomata are usually easily removed, but they sometimes recur.

Treatment.—Sometimes palliative procedures are advisable, but if there is any reason to believe that the growth is of a benign nature, a non-operative course of treatment is to be condemned; if, however, the patient refuses operation, palliation may be the only form of treatment. Excessive vesical hæmorrhage may sometimes be benefited by rest in bed, a restricted diet and daily bladder irrigations with a hot aqueous solution of Alum, four drachms to the pint; fluid extract of Hydrastis, two ounces to the pint; or equal parts of Extract of Witch Hazel and warm water. Aqueous solutions of Nitrate of silver, as well as those of Adrenalin chloride or Antipyrine, are often helpful.

Irrigations with a solution of Nitrate of silver made from a standard solution of one grain of Nitrate of silver to one

drachm of distilled water, acidulated with a small quantity of pure Nitric acid, are often beneficial, the strength at first being quite weak, commencing with a solution composed of half a drachm of the standard solution to four ounces of warm water; the quantity of the standard solution is gradually increased until one or even two drachms are employed, regulating it so that no pain, increased frequency of micturition or straining follows the irrigation. Occasionally, when the solution of maximum strength has been in daily use for a considerable period, the bladder becomes irritable, and a weaker solution must be employed, but the treatment should not, on this account, be discontinued. About two ounces of the selected solution should be introduced into the bladder, retained for a few seconds, then allowed to discharge itself through the catheter while the syringe is being refilled. The douching must be repeated daily and continued without intermission for four, five, or six months, reaching the maximum strength of solution some five, six or more weeks from the commencement of the treatment. If bleeding has ceased, as it should do, the irrigation must be continued every other day for six months or longer, and afterwards every third day for a variable period. After this long course of treatment the application may be discontinued, but should blood reappear in the urine the daily douching—commencing with the minimum strength and gradually increasing—must be again employed. In this way hæmaturia, as well as the growth, may be permanently controlled, and the patient may live in comfort for many years. The treatment at the start may occasionally increase the hæmorrhage, but after several applications, the blood lessens in quantity and finally disappears. Sometimes it never entirely ceases, being especially noticeable in small quantities at the time of catheterization, though every precaution may have been taken in introducing the instrument. It is apparently caused by the catheter disturbing a growth situated near the neck of the bladder.

Clots of blood in the bladder are generally best left undisturbed ; if necessary, they may be evacuated by means of the Bigelow evacuator and the bladder irrigated with a hot Adrenalin chloride solution. If they become lodged in the urethral mouth causing over-distension of the bladder and pain, continuous catheterization may be required. If hæmorrhage threatens life, or pain and the other symptoms become agonizing, operative relief will be advisable. The bladder must not be allowed to become over-distended ; straining at stool and all forms of excesses must be avoided and a mild and non-stimulating diet advised. The cystitis is often relieved by general local antiseptic treatment, though a supra-pubic cystotomy for drainage may become necessary.

Surgical relief may be palliative or remedial. The palliative operations are drainage of the bladder by the perineal or supra-pubic route, the latter being preferable unless the growth occupies the anterior wall of the viscus. In the female the vagino-vesical route is to be preferred.

Tumors of the bladder, if small, may be removed through the urethra by the lithotrite, the snare, or by means of the operating cystoscope, using the associated electro-cautery wire ; this, by means of the cystoscope, is thrown around the growth which is then burned off and in time voided per urethra, or through a perineal opening. These methods, however, are unsatisfactory, as portions of the growth may escape notice.

Supra-pubic cystotomy for the removal of vesical growths differs in no way, so far as the general technique is concerned, from the ordinary operation which will be described under the treatment of vesical calculus. Occasionally when the growth is very large it may be necessary in order to increase the exit space to make a transverse incision, one-half to three-quarters of an inch long, in the bellies of the recti muscles about half an inch above their attachments to the pubes.

This can be done without causing subsequent material weakening of the abdominal wall. Trendelenberg originated the transverse supra-pubic incision by which the peritoneum is avoided and more operative space obtained. If the opening is not of sufficient size, the attachment of the rectus abdominalis can be completely divided, the pubes resected or symphysiotomy performed.

An electric light introduced into the vesical cavity will facilitate the ocular examination. If a growth is discovered, the vesical wall is temporarily sutured to the abdominal opening to prevent its being separated from its attachments during the subsequent manipulations. Small tumors may be caught with the volsellum forceps or the Guyon clamp and drawn upward

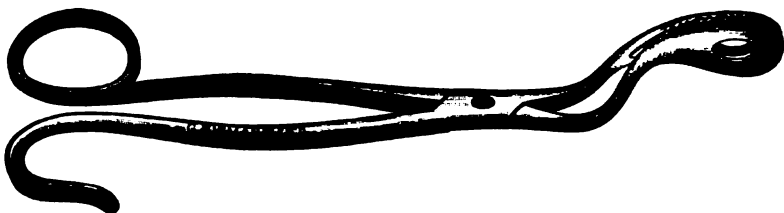


FIG. 126.—Thompson Vesical Forceps.

into the wound and removed by an elliptical incision through the base of the pedicle and the wound closed with catgut sutures, which must be carried to the bottom of the excavation, or it may be removed by an ecraseur, or with the Thompson forceps (Figs. 126, 127 and 128). Curettement and cauterization of the growth have also been beneficial.

Resection of the Bladder.—This operation may be necessary in the surgical removal of malignant growths and in papillomata which have stout pedicles, where cauterization is not considered sufficient even when they are apparently benign in character. In all vesical growths which are truly sessile or where there is any evidence of infiltration of the bladder wall,

as always occurs in malignant growths, a section including the whole thickness of the mucous and muscular coats of the bladder and area of tissue at least one-half inch beyond the limit of the induration must be excised. If the growth is situated on the lateral or upper wall of the bladder and the supra-pubic incision is made through the abdominal walls, the peritoneum



FIG. 127.—Thompson Vesical Forceps.

is dissected off and the required portion of the bladder wall and its attached growth removed. Each layer of the mucous and muscular coats of the bladder are then approximated by interrupted catgut sutures. Free drainage of the supra-pubic wound is provided and a piece of gauze drainage is placed between the united incision in the bladder wall and perito-



FIG. 128.—Thompson Vesical Forceps.

neum. This is particularly necessary to prevent infiltration and facilitate rapid union; when the peritoneum is adherent to the bladder wall a laparotomy will be necessary in order that all the diseased tissue may be removed. When the vesical growth is located at the base of the bladder the presence of the ureters, the prostate and urethra must be considered.

When it is believed that the edges of the wound can be approximated after the excision of the vesical tumor the knife or scissors should be used in the removal of the growth, though the bleeding is liable to be profuse. This, however, can be controlled to a certain extent by the use of the rectal colpeurynter which, when fully distended, presses upon the pelvic plexus of veins and also forces the field of operation up into the wound. When the tumefaction is so large that it is evident that the edges of the wound formed by the removal of the growth cannot be approximated and sutured, the incision should be made with the thermal cautery at a cherry red heat. This form of incision bleeds little; if hæmorrhage does occur it can be controlled by further cauterization. When the growth is removed in this manner the raw surfaces are left to granulate, and the wound and bladder packed with Iodoform gauze or left empty. The urine can be diverted from the wound until granulation has commenced, *e. g.*, in about forty-eight hours, by means of ureteral catheterization. If this is not done the bladder should be douched twice daily with an aqueous solution of Salt or Electrozone. After this operation there is generally considerable oozing of blood. If this becomes excessive, it may be controlled by irrigations with a hot 25 per cent. aqueous solution of Alum, one of Hydrogen peroxide, or one of Adrenalin chloride.

Extirpation of the Bladder.—The total removal of the bladder is a most formidable operation. It has been attempted only a few times and the results have been extremely unsatisfactory.

Statistics indicate that resection of the bladder is advisable in papillomata, myomata and fibromata of the bladder. When the growth is malignant no matter how small it is, or how completely it is removed, it will surely recur and prove fatal; therefore, in these cases, cystotomy with drainage is preferable, as it subjects the patient to no special risk

and assures him as long and perhaps a more comfortable life than the radical operation.

Argentum nitricum, *Arsenicum*, *Geranium*, *Hamamelis*, *Ipecacuanha*, *Millefolium*, *Secale cornutum*, Sulphuric acid and *Thlaspi bursa pastoris* have their reported cures. For special indications see Carleton and Coles' Classified Index of the Homœopathic Materia Medica for Urogenital and Venereal Diseases.

CALCULI AND OTHER FOREIGN BODIES IN THE BLADDER.

Vesical Calculi.—Etiology.—Stone in the bladder is pre-eminently a disease of children and old men. Vesical calculi are comparatively infrequent in the female, due probably to the shortness of the urethra and easy exit provided for small vesical stones. The statistics of 10,467 hospital cases compiled by Civiale, Coulson and Thompson gives 62.23 per cent. occurring in patients less than twenty years of age, while Sir Henry Thompson reports 798 private cases, 175 occurring in patients over seventy, 527 between fifty and seventy, 93 between sixteen and fifty, and 3 under sixteen.

Vesical concretions are due to the cementing together, by an organic material, of the solid constituents of the urine which ordinarily remain in solution but have for some cause been precipitated. Vesical calculi are naturally grouped into three classes:

Those composed of uric acid, urates, oxalate or carbonate of lime. They are largely the result of over-concentration of the urine from indigestion, the use of sweet wines and malted liquors, over-indulgence in eating with lack of exercise, over-acidity of the system (lithemia), ingestion of starchy and fatty foods, or a decrease in the amount of salt ingested that is necessary to render the individual thirsty and cause him to drink sufficient water during the twenty-four hours to keep the uric acid, etc., in solution.

Those composed of ammonium magnesium phosphate and phosphate of lime. They develop primarily in the bladder and are due to the deposit of certain inorganic salts, the product of an inflammatory condition within the viscus itself.

The third group includes the infrequent forms, such as xanthin, indican, cholesterin, cystin, and those formed from elements entirely foreign to normal urine, *e. g.*, fibrin, blood and some of the blood-coloring matters.

The organic cement is composed largely of a colloid material which originates in some inflammatory process of the urinary tract. This material is not present in appreciable quantities in normal urine. If this were otherwise nearly every one would suffer from vesical calculus, as at different times in the existence of almost every individual a quantity of crystalline matter is discharged with the urine.

Faulty hygiene, inadequate clothing, poor and insufficient food, irregularity, etc., in eating, as well as sedentary habits, over-eating, etc., are recognized as potential factors in the predisposition to and production of stone in the bladder.

It is believed by many that drinking the so-called hard waters of certain geographical districts occasions vesical calculi. This is true to the extent only that hard waters are not diuretic and their use induces an over-concentrated urine, with a relative increase of uric acid, oxalate of lime, etc. The poorly nourished and particularly those who habitually partake of food not easily digestible are liable to stone in the bladder. There are certain countries or regions where vesical calculi are of frequent occurrence, as the eastern part of Russia, China, India, Arabia and Tennessee and Kentucky in the United States. In the New England States they are uncommon.

Pathological Anatomy.—Vesical calculi vary in size from one not sufficiently large to prevent its expulsion through the urethra to one of extreme dimensions. Preston has reported

a vesical calculus weighing fifty-one ounces, and Milton, in Egypt, one weighing thirty-two ounces. A vesical stone weighing four ounces is considered enormous, and one weighing an ounce, about the size of an average English walnut, is of unusual dimension.

Vesical calculi differ greatly in color. When composed of urates or uric acid they are brick-colored or yellowish red, the oxalate of lime are grayish or grayish-black and the phosphatic are usually white or yellowish white. Cystin calculi have a yellowish tinge.

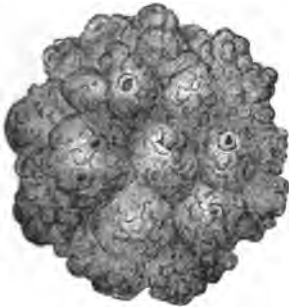


FIG. 129.—Mulberry Calculus.
(Ultzmann.)

Calculi vary in structure, depending upon the elements of which they are composed. When the concretions have been caused by urinary obstruction and vesical catarrh, they are occasionally composed of one element, as uric acid or oxalate of lime, but generally they are made up of two or

more layers of the different elements, depending upon the condition of the urine at the time the crystals were deposited.

In the density of vesical calculi there is much diversity. Oxalate of lime calculi are hard and broken with difficulty; the uric acid are less compact, while the phosphatic are light in weight, soft, and often crumble easily on pressure, particularly after exposure to the atmosphere.

Vesical calculi usually take their origin in a small phosphatic, uric acid or urate crystal, which, having formed in the pelvis of the kidney, escaped through the ureter and lodge in the bladder. A vesical stone may form in the bladder about any foreign material which has in any way gained entrance, the epithelia, mucus, bacteria, etc., present covering it with a soft sticky mass to which the solid constituents of the urine adhere and form successive layers around it.

Vesical calculi vary greatly in form. When free they are generally spheroidal. Some are round and smooth, others rough and irregular; they may be laminated. Oxalate of lime calculi are especially liable to be rough, with knobby surfaces, and are often designated as mulberry calculi (Fig. 129). Uric acid calculi are usually smooth and sometimes extremely well polished. The phosphatic (Fig. 130) are fairly hard and generally have a regular, smooth, rounded surface with a



FIG. 130.—Fractured Phosphatic Calculus, Natural Size.

varying degree of polish; occasionally the exterior is somewhat gritty.

Calculi differ also in the rapidity with which they are formed, the oxalate of lime variety requiring several years to attain any considerable size, while the phosphatic, developing in a bladder of one suffering from urinary retention and cystitis, increase very rapidly, and sometimes in from six months to two years attain a weight of one or more ounces.

The vesical calculus is usually movable and lies in the

most dependent portion of the bladder. When the patient stands erect it usually rests upon the triangular portion of the bladder bounded by the urethral opening and the ureteral outlet; when reclining it tends to fall back behind the ureteral openings, though in prostatic obstructive hypertrophy the stone may remain in the post-prostatic sac and change very little with the different positions of the body.

An encysted vesical (Fig. 131) calculus is rare. Occasion-

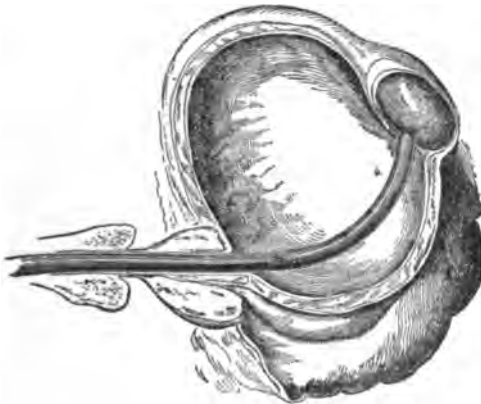


FIG. 131.—Bladder with an Encysted Calculus. (Coulson.)

ally one is associated with coincident prostatic hypertrophy, the symptoms of which it decidedly simulates, the ordinary characteristic symptoms of stone in the bladder being absent. These calculi are seldom detected by the stone searcher, being well covered by mucus and detritus; in fact, they are rarely discovered until the bladder is opened. Their most common location is behind the prostate; they have, however, been found in the anterior wall of the bladder behind the pubes. They have been the cause of perforation of the bladder walls and urinary extravasation. An encysted stone may be fixed in or connected in some manner with the ureteral opening,

owing to the fact that the original stone or nucleus in its migration from the kidney was too large to pass the ureteral outlet and only a portion of it projected into the bladder around which the urinary salts became deposited. As the portion within the ureter increased in size the calculus assumed a dumbbell shape. The vesical end of the encysted stone sometimes breaks off and forms the nucleus of an independent calculus.

Several calculi may be simultaneously present in the bladder, but it is unusual to find more than one. When several are present (Fig. 132) they may be faceted from the rubbing together of their opposing surfaces; frequently they join together to form into one rounded mass. Sometimes the presence of a number of stones is due to a previous spontaneous fracture of the original calculus. Ord is of the opinion that this disintegration is due to swelling of the colloid cement caused by a change in and the absorption of fluid of a different density from the urine.

Clinical History.—The prominent clinical symptoms of stone in the bladder are pain, reflex disturbances, frequent urination, hæmaturia, together with pathological changes in the urine, which vary according to the character of the calculus and whether the bladder was free from lesions previous to the appearance of the renal concretion, or whether the calculus was preceded by cystitis and urinary obstruction. The uric acid stone with its smooth surface induces little irritation, pain, etc., while the oxalate of lime with its numerous knobs is very irritating and produces an accompanying cystitis. Sometimes the calculus may cause little annoyance, especially if the stone is so situated that it does not impinge upon the urethral orifice.

A vesical calculus formed by the deposit of urinary crystals about a minute renal concretion which has lodged in a healthy bladder presents a very different symptomatic picture

from one which is due to and is formed secondarily to a chronic cystitis.

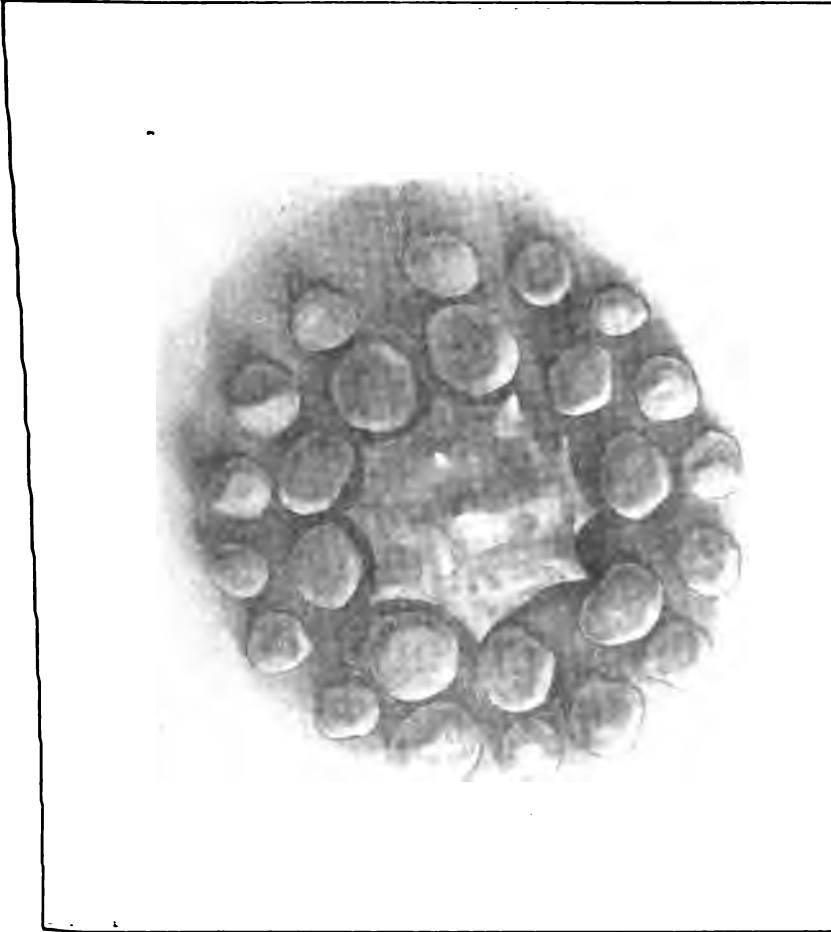


FIG. 132.—A Nest of Twenty-Five Phosphatic Calculi, Natural Size.

In the first class there is usually a history of attacks of gravel or renal colic, supposed appendicitis, intestinal colic

or some other acute abdominal disturbance, with possibly an accompanying slight hæmaturia, followed by a pricking as if a sharp-pointed body were passing through the urethra while micturating, with the discharge of a hard substance, which attracted attention by the noise it made on striking the vessel. Hæmaturia is especially likely to be remembered, even though the pain connected with it has been forgotten. A renal concretion may, however, reach the bladder without producing sufficient pain to attract the notice of the patient.

The second class is always associated with defective bladder drainage and inflammation. The calculus is generally of the phosphatic variety, the nucleus of the stone originating, as a rule, in a deposit of phosphates upon the inflamed mucous membrane. When, however, a renal nucleus drops into an inflamed bladder with poor drainage, and it is not quickly removed, a phosphatic calculus will almost invariably result, the character of the nucleus depending upon its renal origin.

The pain excited by a vesical calculus varies with the pathological condition of the bladder and the character of the stone. When the post-prostatic vesical space is large, a calculus of considerable size may give rise to very little pain; while a small stone in a bladder with a small post-prostatic space, may easily fall into the urethral outlet, during each act of urination, become squeezed as the bladder contracts, and give rise to excruciating pain, or, when small and smooth; it may pass into the urethral opening, obstruct urination and excite or spasmodic pain or cause urinary retention.

Large stones are not as liable to be caught in the muscular grasp of the vesical neck, as are small ones, hence they are frequently borne with less discomfort. Pain is usually present at the end of micturition; it is referred particularly to the glans penis, though it may be located in the vesical region, the perineum, rectum, sacrum or lower part of the back; it

may extend into one or both testicles or down the sciatic nerve and be centred in the foot or heel. When the pain radiates into the testicles or is spasmodic, the cremaster muscle usually contracts during the paroxysm. Sometimes the pain from the presence of a vesical stone diminishes with its development. This is due to the increase in size and its becoming smooth from encrustation with phosphatic deposits. The pain is always aggravated by bodily movements, particularly horseback riding, long walks, railroad and automobile traveling, and is ameliorated by complete rest. It is often relieved by assuming the horizontal position, lying upon the abdomen, or with the hips elevated. If the stone is small it may, however, be caught in the vesical neck and be retained so that change of posture on the part of the patient gives no relief. While searching for a stone it may become dislodged and in its new position the pain may be lessened or absent for a longer or shorter period.

The vesical tenesmus caused by the presence of a stone in the bladder often excites an associated rectal tenesmus with prolapse of the rectum in children, and protrusion of hæmorrhoids or the development of inguinal hernia in adults. In children, during the pain, there is a tendency to priapism with inclination to grasp the penis. In the adult it not only may induce priapism, but emissions and symptoms of sexual excitement.

The calls to micturition become abnormally frequent and often painful. The increased desire to urinate may be distressing and continuous; there may be incontinence, due to vesical tenesmus. Any violent jar or sudden movement of the body may be followed by a spontaneous discharge of urine, necessitating the constant wearing of a rubber urinal. The character of the urinary stream is often greatly changed. If the stone is small and movable it may roll into the vesical neck and produce a temporary urinary obstruction, so that

the flow may at times be free and forcible, the act being **accomplished** without trouble or disturbance, or it may **suddenly** stop and recommence only to stop again ; this condition **can** often be overcome if the patient urinates while lying on the back. Frequency of micturition is always increased **during** the day by motion and is relieved by rest.

The urine almost always contains a varying number of **red** blood corpuscles. They may be so scanty as to be barely demonstrable by microscopical examination. If the calculus is smooth the hæmaturia may escape notice, but when the calculus is rough or knobbed, or where the inflamed vesical mucous membrane is granular and congested there will be a history of hæmaturia occurring at intervals. This is especially true when a small calculus is caught in the vesical neck and squeezed, as it were, at the end of each micturition. The hæmaturia is always intermittent.

When a vesical calculus develops within a healthy bladder, the urine, though clear, will contain an excess of mucus, some leucocytes, sometimes coagulated blood, epithelia and crystals of the same material as that of the calculus. Slight traces of albumen may be present. If the bladder is infected the urine will present all the evidences of a true cystitis and contain in addition a varying number of blood corpuscles. The urine may be acid or alkaline in reaction.

Diagnosis.—While a vesical calculus may be strongly suspected from the clinical history, a careful digital examination of the bladder must be made through the rectum in the male or the vagina in the female, supplemented by supra-pubic palpation and intra-vesical investigation with instruments passed through the urethra or through an exploratory supra-pubic or perineal incision.

Digital examination through the rectum rarely gives positive information. Sometimes, however, in a thin subject, if, after voiding the urine, he leans well forward over the arm of

a chair, and the surgeon presses over the pubes with the left hand and introduces the index finger of the right into the rectum, if the calculus is of large size, it may be discovered, especially if it lies in the posterior vesical pouch. Exploratory incision for diagnosis is rarely necessary excepting where the clinical history is convincing and the calculus eludes the most careful examination by means of the stone searcher and the cystoscope.

In making an intra-vesical examination the senses of sight, hearing and touch are required. In this class of examinations the patient should be placed on the back with the shoulders low, the thighs flexed on the abdomen and separated, and if there is much prostatic enlargement, the hips raised by means of a pillow. When the stone searcher is to be employed, the bladder should be distended with from four to six ounces of a warm, saturated, aqueous solution of Boric acid; a larger quantity than this makes it difficult to find a small calculus, while with less, a stone may easily remain hidden in some of the folds of the mucous membrane. Ordinarily, from four to six ounces of fluid can easily be introduced into the bladder, but where a hard stone has caused continued irritation and a hypersensitive condition of the mucous membrane, general anæsthesia may be necessary before the bladder can be properly distended and examined.

The original Thompson stone searcher is practically a hollow sound with an extra long shaft, the straight portion being cylindrical, nine and one-half to ten inches long, and twelve to thirteen millimeters in circumference. At the distal end it is expanded into a handle, which is cylindrical, about forty-five millimeters in circumference, having a fluted surface. The handle of the latest model Thompson instrument (Fig. 133) consists of an elliptical, flattened piece of metal which lies in a plane at right angles to the curve of the beak. The under surface of the flat end is corrugated, the upper smooth,

thus enabling the surgeon to keep himself constantly informed as to the direction of the beak. The curved vesical end is somewhat bulbous and flattened a little on the sides. The shaft is small in calibre so as to allow the instrument to be freely elevated and rotated. The old hollow instrument has been entirely discarded, as the catheter combination is of little practical advantage and very objectionable from the standpoint of asepsis.

The same care and attention must be employed in introducing the searcher, as in passing other urethral instruments. When cystitis is present, abrasions of the urinary tract must be avoided if possible. As the curve of the stone searcher is shorter than the normal urethral curve, downward pressure on each side of the penis will straighten the curve and facili-

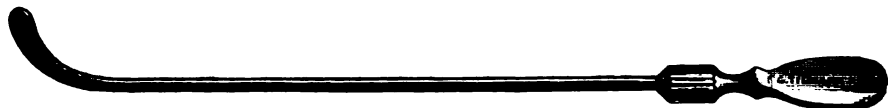


FIG. 133.—Thompson Stone Searcher. (Fuller.)

tate the passage of the instrument. Sometimes it will be arrested in the pouch of the bulbous or the roomy prostatic urethra and will, with difficulty, enter the internal vesical sphincter. When the vesical end has fully entered the cavity of the bladder it can be partially if not completely rotated.

The instrument is introduced carefully and gently until its vesical end touches the fundus of the bladder; it is then slowly rotated, its beak turned down, the handle being raised a little to keep it in touch with the floor. Then it should be brought gradually forward, being constantly rotated from side to side and the entire floor of the bladder examined. If nothing is encountered, it should be pushed back and again brought forward. The sides of the bladder should be similarly examined, the beak being made to rotate from above downward.

When a stone is encountered a sudden jarring, trembling sensation runs along the shaft to the handle, and, if it is of the hard variety, a click, audible in a quiet room to those at some distance, will frequently be heard. The size of the stone can be approximated by tapping it with the searcher at different points.

Vesical calculi located in the post-prostatic vesical sac are sometimes small and difficult to find. The search, however, may be somewhat facilitated if the forefinger of the left hand is introduced into the rectum and pressed up against this space during the examination. Great care must be taken not to injure or roughly manipulate the vesical wall when neoplasms or other diseased conditions are present or suspected. If traumatism is caused by the instrumentation, vesical infection will probably result; therefore, the greatest care must be observed in using the instrument and in systematic washing of the bladder with antiseptic fluids for some time afterward.

Failure to detect a vesical calculus with the stone searcher may be due to its being encysted, imprisoned in a small cavity whose walls largely protect it, fixed by adhesions to the summit or anterior wall of the bladder, covered with blood clots or mucus, lodged in the post-prostatic space between the walls of the bladder and a prostatic overgrowth, or to the failure of the surgeon to enter the instrument beyond the dilated prostatic urethra.

A vesical calculus is sometimes simulated by a tumor, or a fasciculated condition of the bladder walls, which has become encrusted with lime salts, a bony growth, a prominent sacral promontory or a fæcal impaction.

Searching for stone should always be followed by an instillation into or irrigation of the bladder with a warm 1-8000 aqueous solution of Nitrate of silver, and, if the seance has been long or the patient nervous, he should remain in bed for a day or two. Sometimes a second

examination under ether is necessary to make sure of the diagnosis.

Diagnosis based on the use of the cystoscope has come somewhat into vogue during the past few years and often is very important. The X-ray, while more or less extensively used, has generally failed to give positive diagnostic evidence when the calculus was of the uric acid variety; in phosphatic calculi and those with phosphatic coatings the results have been better, as these stones appear with a marked distinctness in the skiagraph, though if the bladder is especially inflamed and much loose phosphatic material is floating in the urine shadows may be thrown which may be to some extent misleading. The same is true in regard to the bones of the pelvis.

Treatment.—This may be divided into prophylactic and operative. Many of those suffering from vesical stone have the fallacious idea that a stone in the bladder can be dissolved by the action of certain mineral waters, some of which are voluminously advertised as efficacious and curative when taken long enough and in sufficient quantities. It can, however, be positively asserted that when a calculus of sufficient size to prevent its escape through the urethra is present in the bladder, it cannot be removed by other than surgical means. Much, however, may be done to prevent its recurrence or its formation in those predisposed thereto. Individuals with tendencies at various times to urinary showers of uric acid or oxalate of lime, or who have at any time voided renal calculi, may be much benefitted and a vesical stone often prevented through the correction of some existing dyscrasia. Each patient should receive individual attention. If the condition is due to dyspepsia, insufficient or improper food, irregularities in diet, etc., they should be corrected. Sometimes it is desirable to curtail a diet which through want of proper knowledge is composed largely of starch, sugar, fats or alcohol.

Bread should be practically interdicted ; lean meats, poultry, game, fresh fish, cereals, eggs, vegetables, lettuce, spinach, celery and fruits may be taken of with impunity. General exercise should be regulated and never allowed to be carried to the point of fatigue.

When the urine contains an excess of oxalate of lime, large quantities of a soft water, possessing diuretic effects, should be ingested daily. Poland, Apollinaris, Bethesda and Highland Spring waters are very efficacious. As nervous or mental strain often causes this urinary condition it should, if possible, be interdicted. If uric acid is present in large quantities, the soluble Lithia salts, Citrate of potash, Piperazine water, etc., will be beneficial. Where there is pronounced urinary obstruction a vesical stone may frequently be prevented from forming by occasionally douching the bladder with a strong aqueous solution of Boric acid or Citric acid as advised in chronic cystitis.

A vesical calculus can be removed directly through a suprapubic, median perineal or lateral perineal cystotomy, or indirectly by crushing it within the bladder with suitable instruments introduced through the urethra and removing the fragments through a special evacuating apparatus.

While the surgical removal of vesical calculi has always been of interest to the genito-urinary surgeon, it is of the utmost importance that the proper individual methods of surgical relief be selected. In children, lateral lithotomy is advised if other things are favorable. Lithopaxy is often indicated in the adult and the aged. Whenever operative relief is indicated it should not be postponed, as the outcome of the operation depends not only upon the size of the calculus and its period of development but upon the danger of renal and bladder complications which are dependent upon these two conditions.

Cabot, in an extensive statistical report, shows that from

infancy to the fourteenth year there is little choice between lithopaxy and lateral lithotomy. Barling, in a series of **one** hundred and fifty-two cases under ten years of age, **gives** statistics decidedly in favor of lithopaxy. As age advances, the results seem to favor lithopaxy, though with the **recent** improvements in the technique of supra-pubic cystotomy it would seem that this is to become the surgical method **of** choice.

Median Perineal Lithotomy.—The external genitalia and perineum having been previously shaved, scrubbed and douched, the patient is placed in the lithotomy position, and, after a preliminary antiseptic toilet of the urethra, the bladder is washed out with Thiersch's or a warm aqueous Boric acid solution; finally about six or eight ounces of the solution is injected and allowed to remain. A urethral staff, grooved on its convex surface, is introduced through the urethra into the bladder and held in position by an assistant so as to press out the perineum exactly in the median line, the assistant at the same time raising and supporting the scrotum. A sharp-pointed bistoury is inserted in the median raphé of the perineum about half an inch in front of the anus and its point carried directly through the tissues to the groove in the lithotomy staff and advanced slightly so as to enter the membranous, and avoid the bulbous portion of the canal and the consequent hæmorrhage. The perineal incision is enlarged to about one and a quarter inches in length upward toward the scrotum. The finger is then introduced into the bladder and the stone located, care being taken not to overdistend or lacerate the parts. If the incision is not of sufficient size, a urethral stricture exists, or the prostatic urethra will not admit the finger or allow the stone to be removed through it, the opening can be carried further posteriorly with a Blizzard knife, the index finger of the left hand being introduced into the rectum to guide against cut-

ting too extensively or injuring the rectal wall. A straight silver catheter is then passed into the bladder, and a spurt of urine will indicate that the bladder has been properly entered. The catheter is then replaced by the Teale gorget. Finally a pair of ordinary lithotomy forceps are introduced into the bladder guided by the gorget and the calculus caught and removed; sometimes it may be desirable to use the stone scoop or lithotomy forceps with crossed blades. The after-treatment is the same as that for external urethrotomy. As no vessels of large size are divided, hæmorrhage is generally slight, and the ejaculatory ducts and seminal vesicles escape injury. The incision divides the skin, superficial fascia, sphincter ani, the lower edge of the triangular ligament, the compressor and membranous urethræ muscles and the apex of the prostate. Median perineal lithotomy is advisable only for adults, and is indicated when the stone is small or when an associated external urethrotomy is necessary.

Lateral Perineal Lithotomy.—Some years ago before the revival of supra-pubic cystotomy, lateral perineal lithotomy was frequently performed upon both children and adults; it has, however, fallen largely into disuse. The patient being tabled as in median perineal lithotomy and the lithotomy staff (Fig. 134) which differs only from the one employed in the median operation in that the groove is situated on the left side of its convexity and terminates in a deep notch about an inch from its distal end, is introduced and then held in position by an assistant. The knife employed to enter the perineum should be narrow and at least three inches long. It must have a handle of good proportions so that it can be firmly grasped. To guide the knife and prevent undesirable wounding of the parts, the surgeon introduces the index finger of his left hand into the rectum and locates the staff and the apex of the prostate. The knife with its cutting edge directed downward is introduced into the perineum in the median line at a

point about one and one-half inches anterior to the anus, it is pressed straight forward until it enters the groove in the staff just above the curve. The staff is then slightly depressed so that a moderate incision into the urethra is made as it and the knife are carried forward. Then a grooved director is carried behind the knife down to the grooved staff. The scalpel is removed and a Blizzard knife, to make a lateral incision through the urethra and prostate, inserted along the grooved director and its end located in the groove in the urethral staff and the director is removed. The Blizzard knife is turned to the patient's left and with a corresponding dip of the handle an incision three inches long is made externally



FIG. 134.—Little Lithotomy Staff.

and far enough from the rectum to avoid the sphincter, terminating at a point in a line falling between the rectum and the tuber ischii to the left of the patient. The knife, guided by the lithotomy staff, is then pushed forward to complete the incision through the deeper parts into the bladder, entrance into the latter being indicated by a gush of urine.

In this surgical procedure the integument of the perineum, superficial fascia, transverse perineal muscle, the accelerator urinæ muscle, the triangular ligament, the anterior fibres of the levator ani, the compressor urethræ, the membranous and prostatic urethræ, the left lobe of the prostate, the neck of the bladder, the prostatic plexus of veins and numerous small vessels are divided. This lateral incision may be some-

what increased by judicious over-distension. There is always danger in this operation of cutting the ejaculatory duct, but if the incision is confined to one side it is not particularly

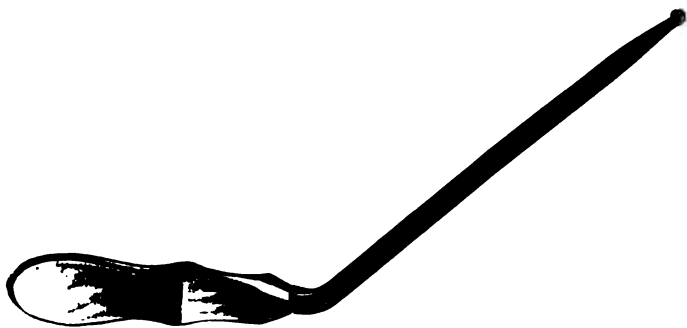


FIG. 135.—Little Angular Gorget with Handle.

detrimental. On removing the knife a probe-pointed gorget (Fig. 135) should be introduced to keep the parts thoroughly open and to facilitate the removal of the calculus either with the straight (Fig. 136) or crossed handle (Fig. 137) curved

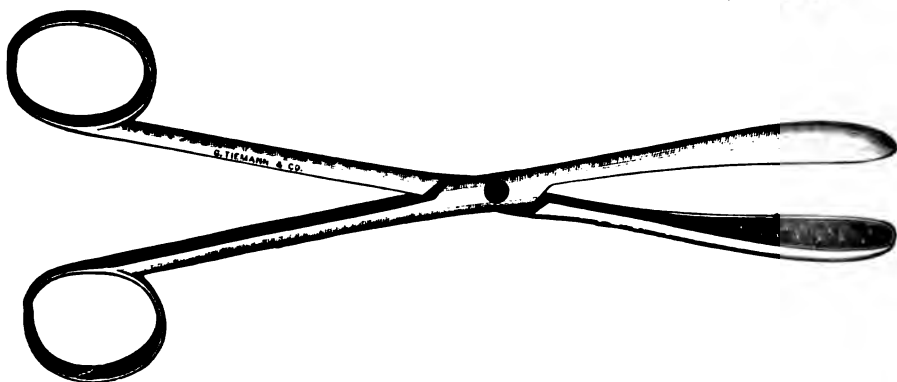


FIG. 136.—Little Lithotomy Forceps.

forceps. If the calculus is large a rocking motion may facilitate its extraction, care being always taken to grasp it in its shortest axis. Large stones should be broken up before re-

moval. Phosphatic stones often break during attempts to remove them and prolong the operation; the scoop (Fig. 138) may be necessary to remove the fragments and prevent their becoming the nucleus of a new concretion.

Hæmorrhage is sometimes excessive; it has been fatal, particularly when the incision has been carried too close to the

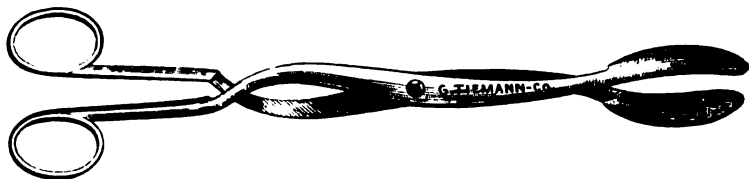


FIG. 137.—Lithotomy Forceps with Crossed Handles.

tuber ischii dividing the pudic artery or some of its branches. When bleeding is excessive, it is best, if the vessel can be reached, to apply an artery clip, which should be allowed to remain three or four days. Ordinarily, however, hæmorrhage can be controlled by proper packing around the perineal drainage tube which should be inserted as advised in external urethrotomy. Sometimes a catheter *en chemise* is necessary (which



FIG. 138.—Lithotomy Scoop.

should always be prepared before the operation by passing a No. 30 to 40 French perineal drainage tube through the centre of a piece of gauze four inches in diameter, wrapping the gauze about the tube and tying it firmly about an inch from the end with silk so that the gauze will hang loosely forward like a petticoat). When required to stop hæmorrhage

this modified drainage tube should be inserted and plain or Iodoform gauze packed tightly in between it and the attached gauze. Drainage is generally advisable in the adult, while in children it is rarely necessary.

Bilateral Perineal Lithotomy is occasionally practiced when the vesical calculus proves to be larger than was expected. This procedure leaves an inverted V-shaped opening in the bladder and one difficult to close properly; if hæmorrhage occurs it is apt to be fatal.

In children, owing to the small size of the bladder opening and the undeveloped state of the prostate, in the attempted introduction of instruments or the finger into the bladder, the prostate has been separated from its attachment to the membranous urethra and pushed into the pelvic cavity. When this occurs, a supra-pubic cystotomy must at once be performed and proper drainage instituted. The rectum is sometimes accidentally incised during a perineal lithotomy. When this happens the rectal incision must be closed by a continuous catgut suture; the wound generally heals kindly, though a recto-urethral fistula may follow.

After the operation, to remove all blood clots, etc., the bladder should be douched through the drainage tube with a saturated aqueous solution of Boric acid at a temperature of 110° Fahr. This douching should be continued daily as long as drainage is continued. Where it has been necessary to use the catheter *en chemise* for hæmorrhage it may be safely removed at the end of the third day. For further after-treatment, see external urethrotomy.

Supra-Pubic Cystotomy.—This surgical procedure offers a great number of advantages, is open to few objections and is often advantageous as a method of entrance into the bladder for the purpose of removing large vesical calculi or growths. The patient having been anæsthetized is placed in a semi-Trendelenberg position and surgically prepared. A Peterson col-

peurynter to raise the bladder from its deep position in the pelvic cavity may be introduced into the rectum and distended with about ten ounces of sterile water. This procedure has, however, been discarded by the majority of surgeons as unnecessary and by some is considered an element of danger. The urine in the bladder is evacuated through a silver catheter having a prostatic or Benique curve, the distal end of which is introduced into a proper-sized drainage tube about six inches in length and securely fastened by a silk ligature. This facilitates the introduction of the solution necessary to wash out and distend the bladder. After the fluid contents of the bladder is evacuated, the viscus is douché with a sterile Boric acid solution at a temperature of 100° Fahr. The bladder is finally filled with the Boric acid solution, care being taken not to over-distend the viscus, though it may be filled to a point where expulsive contractions are induced. To prevent the fluid escaping alongside the catheter a soft rubber catheter or tape is tied around the base of the penis. The usual quantity needed is from ten to twelve ounces, but sometimes twenty may be required; other bladders will not tolerate more than one or two ounces. When the bladder has been distended by a sufficient volume of the fluid, the tube connected to the silver catheter is folded upon itself, tied with silk and the catheter given to an assistant to maintain in position. Some advocate distending the bladder with air, but this has as yet not been generally adopted. Distension of the bladder is not necessary, though it renders the operation less difficult. After the proper preparation of the bladder an incision two and a half to four inches long, commencing at the upper border of the symphysis pubis and extending upward toward the umbilicus, is made in the median line of the abdomen. This incision divides the integument, superficial and deep fascia and the fascia covering and lying between the recti muscles.

The fibres of the recti muscles are separated by blunt dissection through the space between the muscles, if possible, but if the space is not easily found the sheath of the muscle is incised parallel to the muscle fibres, separation continued, and the space of Retzius and the perivesical fat exposed. Unnecessary blunt dissection must, however, be avoided as it favors subsequent urinary infiltration. The tip of the forefinger is passed down behind the symphysis and by a careful stripping upward, the fat and peritoneum are carefully rolled up and the globular, whitish, glistening, fluctuating bladder wall exposed. Unless adherent, the peritoneum is not seen; if by accident it is torn it should be closed by a continued catgut suture. The distended bladder is further exposed by separating the walls of the abdominal wound with a spring retractor. The external end of the silver catheter being carried by the assistant down between the thighs, the end which is inside the viscus presses the bladder wall outward. When its location becomes apparent the vesical guy cords, of No. 10 twisted silk eighteen inches long, one to each side, are introduced through the bladder wall about an inch above the symphysis, with a curved round needle, which is carried through the bladder so as to include an inch and a half of its wall, the points of entrance and exit being between the separated abdominal incision on the outside and the protruding point of the catheter on the inside. To prevent the escape of a large portion of the fluid through the needle holes in the bladder the second guide should be introduced quickly, and, to prevent the guy cords being pulled out, the ends of the silk cord should be tied. By traction on the guy cords the bladder is slightly elevated, and an incision about an inch long is made with a scalpel, its cutting edge being directed upward, in the median line of the distended bladder between the guy cords. The fluid in the bladder gushes out and a Fuller bladder retractor (Fig. 139) is introduced to elevate

the fundus, prevent the bladder from being torn from its attachments and facilitate the entrance of the finger to examine for new growths, calculi, prostatic enlargements, etc. At this point, the silver urethral catheter and the band around the base of the penis are removed. If ocular inspection is necessary the vesical incision may be carried upward and the edges of the wound retracted or a glass speculum inserted, and the interior of the bladder illuminated by transmitted light or a small electric lamp. In rare instances, more space is necessary to

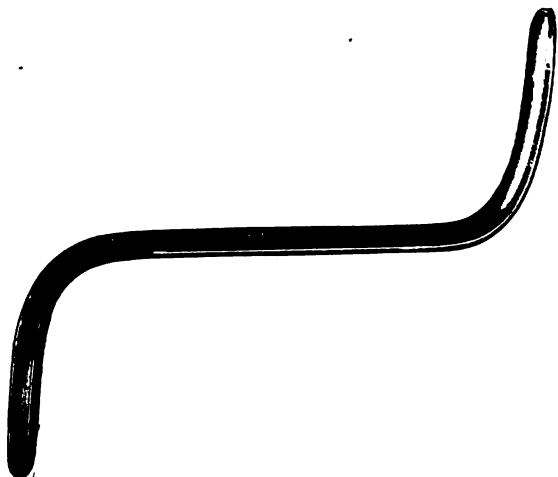


FIG. 139.—Fuller Bladder Retractor.

remove a calculus or growth, when the recti muscles may be divided for half an inch or more, transversely, about an inch above the pubes.

Death, which has sometimes followed supra-pubic cystotomy, has generally been traced to septic infection through the space of Retzius. This accident can be prevented by the early walling off of this space, attaching the lower third of the vesical opening to the corresponding part of the divided recti muscles by a continuous catgut suture, and in closing the

supra-pubic opening to fix the bladder and abdominal walls as advised by Fuller, *e. g.*: A Cleveland-Peasley needle is entered through the abdominal integument three-fourths of an inch from the side of the wound at a point corresponding to the junction of the lower two-thirds with the upper third of the supra-pubic wound. It is carried through the muscular tissue, fascia and the walls of the bladder (including three-fourths of an inch of the bladder wall) to a similar point of exit on the opposite side. The needle is threaded with silk worm gut which is carried to its place by removing the instrument. Two or more silk worm gut sutures are then introduced above sufficiently deep to close the wound but not to enter the peritoneum. A silk worm gut suture similar to the first is placed at the junction of the lower third with the upper two-thirds of the wound and the lower third closed in a manner similar to the upper third. To further hold the bladder wall in place and prevent leakage one end of each guy cord is threaded on a needle, the skin transfixed and loosely tied.

Where cystitis is a complication, and a supra-pubic cystotomy becomes necessary, drainage as advocated by Guyon is advisable. It is instituted as follows: Two drainage tubes eighteen inches long, bent at right angles four inches from their proximal ends, are inserted through the middle third of the incision; when in place the short ends reach almost to the floor of the bladder. The drainage tubes are retained in place by transfixing them and tying them to one of the guy cords. The silk worm sutures are tied, the parts dusted with Aristol, covered with gauze and the dressing retained by a many-tailed bandage. Packing around the tubes is unnecessary and objectionable. The two drainage tubes are connected by glass connections with long pieces of rubber tubing which terminate at the bottom of a bottle at the side of the bed in a known quantity of Bichloride of mercury, 1-1000. The bottle may be readily marked off for convenience of measuring

the quantity of urine evacuated by attaching a piece of surgeon's plaster on its side and noting the level of the ounces with a lead pencil. If the tubes become obstructed they can be opened and drainage re-established by injecting through them one or two ounces of a warm aqueous solution of Boric acid.

During the eight or ten days necessary for bladder rest and for the urine to reach a normal condition, the tubes are left *in situ* and the bladder irrigated daily with one to two quarts of a warm saturated aqueous solution of Boric acid, a 1-4000 Bichloride of mercury, or a 1-10 of Borolyptol, and, if hæmaturia is present, with a 1-1000 Adrenal extract solution. After the drainage tubes are removed the bladder should be douched every second day with the selected solution introduced through a catheter passing through the urethra, the solution being allowed to flow from the supra-pubic opening into a cotton pad. Instruments must never be passed through the supra-pubic opening after the drainage tubes have been removed. The abdominal wall must be protected from the escaping urine by dusting it with Stearate of zinc and Acetanilid and the fluid collected as it oozes from the wound upon a combination dressing, held in place by a many-tailed bandage. The dressing must be changed as often as it becomes wet and the parts antiseptically dressed before a new one is applied.

The patient is usually able to leave the bed for a short time by the fourteenth day. The silk worm gut sutures can be removed about the end of the third week; the wound is generally completely closed during, or before the end of, the fourth week.

Since the adoption of the above technique universally good results have followed supra-pubic cystotomy. When urinary extravasation into or abscess of the space of Retzius occurs it may be necessary to open the wound and institute drainage,

though, if the condition is not pronounced, it may be advisable to wait for the abscess to open spontaneously, when it will discharge a foul and purulent fluid. If a supra-pubic fistula follows, the bladder should be douched daily with a 1-10 Borolyptol solution and continuous catheterization instituted. Cauterization of the fistulous tracts with Nitrate of silver fused upon a small silver probe may be necessary. This condition rarely occurs unless some urinary obstruction exists. From over-distension of the bladder, either due to urinary obstruction or improper douching, reopening of the cicatrix sometimes occurs. When extravasation is detected the parts should be freely incised and an expectant treatment instituted. Sometimes, where an inoperable urinary obstruction exists, continuous drainage through the supra-pubic opening is advisable; when this is necessary to prevent closing of the wound, a small flap of the abdominal integument is turned in behind the original supra-pubic drainage tube and connected by cat-gut sutures to the mucous membrane of the bladder. When the union is complete, a No. 30 catheter, angular in form, is introduced through the supra-pubic opening into the bladder and held in place by a retaining abdominal pad and a spring which encircles the body (Fig. 34), holding the catheter in a satisfactory manner.

The drainage tube should be changed frequently, as it may become encrusted with the salts of the urine, and irritate the bladder mucous membrane, causing cystitis, etc. When such irritation occurs it may be necessary to shorten the arm of the angular catheter which enters the bladder. The free end of the tube may be closed by a small flat cut-off so as to give an interrupted flow, or the urine may be allowed to pass continuously into a urinal at the side of the leg.

Closure of the supra-pubic wound, when there is a co-existing cystitis, is not considered advisable. When the bladder wall is in good condition it may be closed to advantage, pro-

vided proper perineal or urethral drainage to prevent too early distension of the bladder is employed. Urethral drainage by means of the retained catheter is objectionable, not only on account of the small calibre of the catheter, which interferes with the discharge of the clots of blood and bladder debris, but also on account of its inducing, by its presence, pain or urethritis which may necessitate its too early removal. When it is decided to close the supra-pubic wound, perineal drainage may be provided as follows: A large urethral staff, grooved on its convex surface, is passed into the bladder and held in place by an assistant; the tip of the index finger of the left hand of the operator is passed into the rectum and placed upon the apex of the prostate; then with a straight sharp-pointed bistoury the perineum is transfixed in the median line a little in front of the rectum, the point of the bistoury being directed by the finger in the rectum to the groove in the urethral staff near the apex of the prostate and the incision is enlarged to sufficient size to admit the drainage tube. A long silver probe, through whose eye has been tied a stout silk thread, the thread being also tied to the tip of a perineal drainage tube about 35 French in calibre, is passed along the blade of the knife into the urethra and bladder. The knife and urethral staff are then withdrawn, the vesical end of a silver probe is located through the supra-pubic opening and it and the catheter are drawn through the small punctured perineal wound into the bladder and the inner end of the perineal tube is located in the bladder as already described under external urethrotomy. By pressure it prevents hæmorrhage and by its large lumen provides for a perfect vesical drainage during the time necessary for the union of the supra-pubic wound.

When it is considered advisable to close the supra-pubic opening by sutures, certain general principles must be observed. The sutures must not pass through the mucous

membrane; the muscular coat should be approximated by interrupted sutures which should be sufficiently close to seal the viscus against the passage of air and water, and be further protected by the Lambert sutures. The latest and probably the best method for closure of the vesical opening was suggested by Gibson and is as follows: A drainage tube is placed in the bladder wound and the bladder opening sutured close about it. Two inversion sutures are introduced above and below the tube which are tied and a second row introduced, the tying of which completes the closure of the bladder and results in the tube being snugly hugged by the inverted bladder so that no urine can escape around it and the inversion is such that when the tube is removed the funnel-shaped opening is rapidly and permanently closed by intravesical pressure, thus doing away with the many unpleasant conditions which accompany and follow supra-pubic vesical drainage.

Dr. F. E. Doughty describes his supra-pubic cystotomy as follows: After proper surgical preparation and general anæsthesia, the rectum is distended by means of Petersen's bag, inserted well up above the sphincter, with twelve ounces of fluid in order to raise the bladder as a whole and especially its floor upward and forward. This enables the operator, if his fingers are short and particularly if the abdominal walls are thick, to reach the bottom of the bladder with greater facility. The bladder is then distended through a catheter, after washing it until the fluid returns clear, with the selected fluid, using a Politzer bag of a capacity of ten ounces, fitted with a nozzle and stop cock. Where the bladder is contracted the patient is instructed some time previous to the operation to retain the urine for as long a period as possible and measure the quantity voided. This gives a fairly accurate estimate of the capacity of the bladder, and the amount of fluid injected should not be much in excess of this. In the very stout a

metallic catheter with an extra long curve and its distal end plugged is used to make the top of the bladder distinct and afford a firm support in passing the suspending sutures. The fluid is retained in the bladder by tying a tape about the penis. An incision three inches long is made in the median line (extending well over the pubes in the very stout) down to the epivesical fat, which is broken up carefully from below upward with the finger or the handle of the knife, care being given not to disturb the prevesical space or fossa of Retzius more than is absolutely necessary. This exposes the bladder which is cleared for an inch and a half or two inches. The suspending sutures are inserted, one on each side of the median line just below the highest part of the exposed bladder wall, including about one-fourth of an inch of the bladder wall and given to an assistant to hold. The point of a bistoury is inserted between the sustaining sutures, and an incision large enough to admit the finger made towards the pubes. A blunt hook is caught in the upper angle to reinforce the sutures. The finger is inserted into the bladder and the size of the calculus determined. The incision is increased to the required size and the stone removed without force or bruising with the forceps or scoop, the opening being enlarged by transverse incisions if necessary. The interior of the bladder is carefully examined. If nothing more is found the cavity is carefully irrigated with hot saline solution, bleeding checked and the rectal bag emptied and removed. If the urine is normal or nearly so and only a moderate degree of cystitis exists the bladder wound is closed without drainage. Small blunt hooks are caught into the angles of the wound and the edges made tense, while the sutures (No. 00 ten-day chromatinized catgut), interrupted and six to the inch are placed. They include all of the bladder wall except the mucous membrane. Over these are inserted a row of Lambert sutures. A small rubber drainage tube with lateral openings is carried well

down into the prevesical space and fastened to the skin. The wound is closed in layers with catgut, the analogous structures being approximated. The skin is united with silk worm gut sutures which include the subcutaneous fat. The usual dressings are applied. When the wound is closed without supra-pubic drainage, a soft rubber catheter is passed through the urethra into the bladder before the sutures are placed in order to be sure the eye of the catheter is well within the cavity. The catheter is held in position by passing a thread through it and a strip of plaster about the head of the penis. At the end of three days a clip is placed on the catheter and released once an hour for twelve hours, then every two hours for another twelve hours. At the end of this time the catheter is removed and the patient urged to evacuate the bladder naturally every three hours, gradually extending the interval to four hours as the organ shows ability to hold a larger quantity and time sufficient for union to take place has elapsed. The drainage tube in the prevesical space is removed on the third day and its tract syringed daily with an antiseptic solution. Where well-advanced cystitis is present and in old prostatics, to give the bladder complete rest, supra-pubic drainage is established and maintained for a few weeks. Two selected No. 19 or 20 French catheters with large lumens and eyes, the latter as near the end as possible, are fastened together with the eyes outward by a stitch passing through them about three inches from the eyes, care being given not to occlude their lumen. The vesical wound is sutured as before, but an opening is left sufficiently large to admit the catheters and the parietal wound is closed only at its upper and lower ends. The catheters are inserted as far as the floor of the bladder and a suture passed to secure them to the skin. The bladder is irrigated daily with the selected antiseptic fluid, which is gently forced in through one catheter and allowed to pass out of the other. The flow is reversed sev-

eral times at each irrigation. The two catheters are used so that in case one becomes occluded the other will continue to drain the bladder. The dressing is changed as often as is necessary, Sterate of zinc plain or some of the "Dolomol" compounds, or White lead and Linseed oil (common white paint), is applied about the wound to prevent irritation from escaping urine.

In septic cases Senn says, necrosis and phlegmonous inflammations of the margins of the wound and the tissues in the perivesical space—*caverni Retzii*—not infrequently occur as complications of supra-pubic cystotomy, if the operation is performed for affections complicated by septic cystitis; supra-pubic cystotomy in two stages greatly diminishes if it does not entirely overcome this source of danger and therefore advises that the operation be performed as follows: The bladder is freely exposed in the usual manner, when the perivesical fat is dissected away over a vertical oval space at a point corresponding to the location of the proposed vesical incision, after which the wound is packed with Iodoform gauze and the external dressing applied in such manner that it cannot be displaced; the incision in the bladder and the intravesical operation are postponed until the external wound has become covered with a layer of active granulations, which usually requires from five to six days; when the second operation can be performed by the aid of Cocaine without general anæsthesia; this modification of supra-pubic cystotomy diminishes the immediate risk of the operation and affords protection against a number of serious post-operative complications.

The advantage of the supra-pubic operation is that the prostate, the sexual apparatus and the neck of the bladder are not disturbed, complete examination of the interior of the bladder is permitted and the removal of a stone or vesical growth is possible. In removing a vesical stone care should always be

exercised to avoid injuring the tissues through which it is extracted ; it is better to enlarge the incision in the vesical wall than to injure it by contusion. The bladder should always be thoroughly searched for overlooked calculi or fragments before it is closed and the dressing is applied. In supra-pubic cystotomy, whenever there is pronounced cystitis with purulent urine, bladder drainage for eight or ten days thereafter will be necessary. When the urine is aseptic and the bladder wall healthy, the opening in the vesical wall may be closed, but drainage from the space of Retzius must always be maintained for three or four days so that, if there should be urinary leakage, the urine will have a proper exit and not be discharged into the surrounding tissues. If perivesical cellulitis develops the supra-pubic wound must be reopened and free drainage established, and, if necessary, perineal section and drainage which must be utilized until the supra-pubic opening is obliterated.

Lithotripsy.—Originally, surgeons were in the habit of crushing vesical stones by means of a lithotrite and allowing Nature to remove the fragments in its own way. This method called lithotripsy was uncertain and the mortality was high.

Lithopaxy.—Consists in crushing the stone in situ and completely removing it at one operation. It has become quite popular through the advocacy of Bigelow, of Boston, who devised not only a special lithotrite but an instrument for the immediate evacuation and removal of the fragments of the calculus.

The patient should be surgically prepared and placed on his back with his hips slightly elevated and his knees a little flexed. General anæsthesia may be used, though from the length of time often required to complete the operation and the advantage of having the patient conscious it may be advisable to use a local anæsthetic, such as a 1 per cent. solution of Cocaine in the urethra and a $\frac{1}{2}$ per cent. solution in the

bladder, the anæsthetic value of which may be increased by adding a 10 per cent. Antipyrin solution. When the urethra or bladder is hypersensitive or the prostate enlarged, local anæsthesia is contra-indicated. Previous to the introduction of the lithotrite the bladder should be emptied by means of a soft rubber catheter, thoroughly douched with a warm aqueous solution of Boric acid and five or six ounces of the solution left in the bladder.

The closed lithotrite is introduced carefully into the bladder and turned so that its concavity is directed downward toward the rectum and opened, when the calculus will usually roll between the jaws of the instrument which are then closed upon it. If the stone is not grasped the beak should be directed to the side or well into the post-prostatic space behind the prostate by carrying the handle of the instrument upward toward the head of the patient. Care must always be observed to avoid bringing the instrument in contact with and lacerating the vesical walls, thus making an opening for septic infection. When changing the instrument from side to side, the jaws of the lithotrite should always be closed. After the calculus is caught in the jaws of the instrument, the lithotrite must be turned half way



FIG. 140.—Reliquet Alternating Lithotrite.

around on its axis.

This manœuvre lifts the stone from its place of lodgment and also demonstrates that the bladder mucosa has not been caught. In closing the blades and crushing the calculus, the screw must be slowly but firmly sent home, thus preventing to the largest degree the calculus slipping from the closing jaws of the instrument and injuring the bladder or the fragments of the stone cutting the walls. The crushing operation must be continued until all the fragments are reduced to a size which will permit them to pass readily through the urethral tube of exit. Before the lithotrite is removed its jaws must be freed from small concretions and completely closed or on its removal the urethral mucous membrane may be injured.

The lithotrite (Fig. 140) consists of a cylindrical straight shaft about ten inches long and sixteen to twenty-six millimeters in circumference, with a beak modelled in general like that of the stone searcher. The shaft and beak consist of a male and female blade, the male fitting into the female. The portion of the handle attached to the female shaft is barrel-shaped, hollow and supplied with a device for locking and unlocking the male blade which has a screw arrangement. As traction or retraction is exerted on the male blade while the



FIG. 141.—Chesmore Automatic "Mallet" Lithotrite.

traction or retraction is exerted on the male blade while the

female remains stationary, the jaws of the instrument are correspondingly open as indicated by marks on the terminal portion of the shaft. After opening the jaws to any desired size they are securely held by a special lock device. By turning the handle or screw of the male blade, the jaws are approximated and the calculus broken. The jaws of the instrument can be closed or unlocked at any time by the lock attachment.

Various forms of the beak and other modifications of this instrument are on the market. Chesmore's automatic mallet lithotrite (Fig. 141) is often useful. Forbes has one which sustains a crushing pressure of from five to six hundred pounds without bending or breaking. The ordinary instrument, Chesmore's evacuating lithotrite (Fig. 142), has a crushing pressure of from three hundred and fifty to four hundred pounds. It is rare, however, that a power of more than three hundred pounds is required to cause fracture of even the hardest calculus.

The evacuating urethral tubes are made of silver with lumen as large as possible (from twenty-four to thirty-two millimeters), with comparatively thin walls, slightly curved upon the end to render them more easy of introduction and less liable

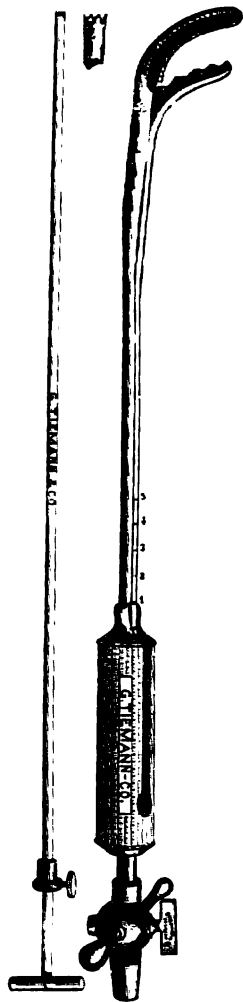


FIG. 142.—Chesmore
Evacuating Lithotrite.

to injure the mucous membrane of the urethra than the straight instrument. Either the Bigelow (Fig. 143) or



FIG. 143.—Bigelow Evacuator.

Chesmore apparatus can be used. The latter (Fig. 144) is very simple, being a bulb of red rubber shaped like an



FIG. 144.—Chesmore Wash Bottle and Aspirating Tube.

ordinary hand syringe attached snugly to a glass bulb and in turn to the metallic urethral tube. In using the evacuating

apparatus the bladder should be distended with six ounces of a warm sterile aqueous solution of Boric acid as Bichloride and other antiseptic solutions are liable to corrode the instrument. The wash bottle is also completely filled with the selected solution, the urethral tube is passed into the vesical cavity, and just as the fluid from the distended bladder commences to flow from its distal end it is controlled by the thumb of the surgeon being placed over its exit and in turn is immediately connected with the wash bottle. The rubber bulb is grasped with the right hand and compressed with sufficient force will throw a large portion of the contents of the bottle through the urethral tube; when the grasp is relaxed the sudden return of the fluid from the vesical cavity brings with it many of the fragments of the crushed stone. This manoeuvre should be repeated until all the fragments of the calculus have been removed. If a large piece of stone should remain and fail to make its exit the lithotrite must be again introduced and the piece crushed into fragments small enough for removal.

Perineal lithopaxy has been advocated by Dobeau and particularly by Reginald Harrison. In this method of lithopaxy, to facilitate the exploration of the vesical cavity and the introduction of the Harrison's lithotrite to crush the stone and its removal, the urethra is opened through the perineum in the membranous portion, the opening can, if necessary, be enlarged by the use of the Dobeau prostatic expander. Harrison states the chief points in favor of the operation, as follows: (1) It enables the operator to crush and evacuate large stones in a short space of time; (2) it is attended with very little risk of life as compared with other operations where any cutting is done, such as lateral, perineal or supra-pubic lithotomy; (3) it is well adapted to old and feeble subjects; (4) it permits the operator to wash out the bladder and any pouches connected with it more effectually than by the urethra, as the route is shorter and the evacuating catheters employed of much larger calibre;

(5) the surgeon can usually ascertain, either by exploration with the finger or by introduction of forceps into the bladder, that the viscus is cleared of all debris; (6) it enables the surgeon to deal with certain forms of prostatic outgrowth complicated with atony of the bladder in such a way as not only to facilitate the removal of the stone, but to restore the function of micturition; (7) by the subsequent introduction and temporary retention of the rubber drainage tube, cystitis due to retention of the urine in pouches and depressions in the bladder wall is either entirely cured or at least permanently improved. The retention of ammoniacal urine in the bladder, which cannot properly empty itself after lithotripsy, favors the formation of recurrent phosphatic stone. Harrison claims that he has never known the wound to remain open. It is well adapted for vesical stone complicated by deep urethral strictures, as it facilitates operation upon both conditions at the same time, and does not expose the patient to danger incurred by lithotripsy via a weakened or permanently damaged urethra.

Foreign Bodies in the Bladder.—Foreign masses other than calculi may enter the bladder by way of the urethra or the ureters, find entrance through the vesical wall from neighboring parts by ulceration, or be forced into it by traumatism. Those which enter through the urethra constitute the largest class and include pieces of catheter, filiform guides, slate and lead pencils, whip cords, hair pins, pieces of grass, twigs of trees, gum, beads, etc. Among the objects which have entered through the ureters are blood clots, bullets, pieces of clothing, buttons, etc.; these having entered the pelvis of the kidney, escaped through the ureter into the bladder. Such substances may also be forced directly into the bladder through its walls. Foreign bodies from the rectum and vagina and other sources, such as pieces of bone, fecal matter, teeth and hair from dermoid cysts, dressing for-

ceps left during a previous surgical operation, etc., have by ulcerative process found their way into the bladder.

Clinical History.—The urine may be unaffected, and if the foreign body is smooth, no symptoms may be present, but if rough, pain generally occurs, and cystitis with frequent calls to urinate and the discharge of a little blood at the end of the act will result. If the foreign body perforates the wall of the bladder, a peri-cystitis will follow; if it passes into the rectum it will cause proctitis, rectal tenesmus, etc., and if into the peritoneum or through the peritoneum into the intestines, peritonitis, etc.

Diagnosis.—This often depends upon the history, though it may require instrumental exploration or cystoscopic examination to make a positive diagnosis.

Treatment.—If the foreign body is soft or flexible, it can be removed with the lithotrite through the urethra. Hard, round bodies can be abstracted in the same manner either before or after they have been crushed. If the substance cannot be easily removed, or it has been in the bladder for a considerable period, a supra-pubic cystotomy will generally be advisable.

SECTION XIII.

SEXUAL FUNCTIONS AND DERANGEMENTS.

The normal sexual instinct is so coupled with parental affection that it not only renders certain the perpetuation of the species but it is the foundation of progress, since sexual differences insure association.

Pubescence is characterized by the awakening of the sexual desire, though it may be conditioned earlier as the result of defective mental powers, congenital or acquired lesions or derangements of the sexual apparatus. With the approach of puberty, the undeveloped sexual organs enlarge and become active, the voice grows deep, the thyroid cartilage becomes more prominent, hair appears on the face and pubes, while the boy becomes courageous, aggressive and manly. During this impressionable period, the parent or teacher should not neglect to instruct the boy concerning the use and care of his sexual organs. If allowed to find his sexual nature unaided or through the instructions of ignorant or vicious parties, he may from such unscientific advice draw harmful conclusions and thus pave the way for mental and physical degeneracy.

While the youth should experience the normal sexual desire, yielding to the appetite cannot be justified by either physical or social laws. Continence reserves the seminal fluid and produces an invigorating influence on physical and mental development.

Relative to the perversion of sexual passion the physician meets three classes of patients: First, those who inherit pecul-

iar mental tangents or suffer from congenital or acquired lesions of the sexual apparatus; second, those who are controlled by the habits of their associates; third, those who have received and acted upon erroneous information. In all three classes, the physician's duty is to remove the cause, that is correct the abnormality of the sexual organs, overcome the mental tendency, insist upon healthy associates and give scientific information.

Erection of the Penis may be incited by impulses generated in the cerebral cortex, tactile manipulations or a combination of both, the impulse causing the muscle fibres of the cavernous tissue to relax, thus enlarging the interspaces in the body of the corpus cavernosi for the reception of a large amount of blood, there to be held by a constriction at the root of the penis caused by muscular contraction. This probably aided by the muscoli ischio-cavernosi causes the penis to assume the erect position.

Coition.—The friction of the glans penis upon the vaginal wall produces increased functional activity of the testes, and by reflex impulses, to the cremaster muscle, they are drawn up and held at the abdominal ring. The spermatozoa developed from the spermatogenetic cells together with the secretions from the coni vasculosi pour into the vas deferens, from whence they are propelled by rhythmical action to the club-shaped ampullation of Henel. The next step in their progress is somewhat mooted, since some claim that the pump-like action of the ampullation forces them directly to the ejaculatory duct while others are of the opinion that they make their entrance into the prostatic urethra by way of the seminal vesicles.

During the sexual act the prostate gland pours its thin alkaline and peculiar smelling mucous secretion into the prostatic urethra, where it is retained and mixed with the combined products of the seminal vesicles and ampullations.

This fluid is held in the deep urethra by the dam effect of the rigid penis and cut-off muscles of the membranous urethra and the sphincter vesicæ. The ever-increasing pressure excites the contraction of the muscle fibres of the prostate, and seminal vesicles and causes an ejaculation. This muscular action of the deep genitalia occurs when the secretions in the prostatic urethra produce sufficient pressure to over-excite the tolerance of the veru montanum.

In the anterior urethra the mucous secretion from Littres follicles, Morgagni crypts and Cowper's glands contribute to the composition of the spermatic fluid. Besides acting as a lubricant to facilitate the onward passage of the ejaculated seminal fluid, these peri-urethral secretions also keep the mucous surfaces of the urethra alkaline and prevent irritation from the acid urine. While a complete seminal ejaculation may vary from a few drops to eight or nine drachms, the usual quantity in a young man is about two drachms, which amount diminishes as age advances. The spermatic fluid has a characteristic odor that resembles sawed bone. It is alkaline in reaction and of a stringy and viscid consistency.

Sexual Derangements of Men.—Congenital or acquired abnormalities of the genitalia are the primary source of a large percentage of these disorders. Physicians attending the birth of a male child should make a careful examination of the genitalia, relieve any abnormal conditions, council cleanliness of the parts and warn against unnecessary handling. While most functional aberrations of the sexual organs can be traced to a hyperæmic condition of the parts, sexual disorders are also conditioned by brain or spinal diseases. Erythism of the sexual nervous centres may enslave its victims so that even a female garment may create uncontrollable sexual excitement. Irritable conditions of the genitalia with erections without apparent stimuli are among the first symptoms of commencing sexual disorders. With the derangements of the sexual

organs there are generally frequent and unsatisfactory calls to urinate often followed by urinary dribbling.

If the true cause of the sexual derangement can be discovered, the prognosis is, in the majority, favorable. The age of the patient is of special importance, in that as age advances the prognosis becomes less favorable for a complete cure. Unnatural acts and excesses of developing youth are the most difficult to cure.

Pollutions.—Seminal discharges induced by any influence other than coitus are known as pollutions. The majority of these abnormal discharges are brought about by masturbation. Physiological emissions resulting from continued continence may occur two or three nights in succession then subside for a month, or they may happen as often as once a week, according to individuality, environment and food. Emissions of this character are usually followed by a feeling of relief, while pathological emissions are characterized by slight transitory headaches, backache, mental depression, etc. The pathological emission is often not accompanied by any pleasurable sensation and sometimes occurs without erection of the penis, from over-exertion, slight tactile or peculiar visual stimuli, etc.

Prostatorrhœa.—This is often due to chronic hyperæmia of one or more of the lobes of the prostate, producing a thin, glairy discharge which may ooze from the meatus urinarius in a varying quantity. It contains a relatively large amount of phosphates, forming a sediment in the urine which is misleading, in that it gives the classical urinary evidence of phosphaturia.

Spermatorrhœa is an easily recognized and usually curable condition, generally caused by masturbation, sexual excess or gonorrhœa. It is due to a relaxed condition of the ejaculatory ducts. The slight urethral discharge which may accompany it and possibly the urine voided contains spermatozoa.

Priapism may be caused by a traumatism of the penis or an abnormal condition of the nervous system. The most common cause is injury to the roots of the corpora cavernosa. Mentally, there is anxiety and apprehension ; physically, the parts are extremely sensitive; agonizing pain is at times produced by the touch of the bed clothes even though the patient reclines on his back with his legs drawn up to protect the parts. Hot fomentations and possibly incision into the injured or hæmorrhagic area, together with the indicated remedy, have proven of great benefit.

Satyriasis is that condition of an individual which makes him such a slave to sexual desire that auditory and olfactory sensations excite as readily as tactile and visual stimuli. It may be acquired or inherited. In short, sexual desire becomes the centre of thoughts and actions.

Impotence may be caused by a hyperæmic or catarrhal condition of some portion of the canal traversed by the seminal fluid, or lesions in the brain or nerve tract. It conditions feeble erections, though the sexual desire be strong, and during sexual congress engenders too early ejaculation. Impotence has two stages, the hyperæmic and anæsthetic. Unnatural methods and excesses cause the first, and infiltration of inflammatory products the second.

On attempting intercourse, intromission is only possible when the vagina is large, and even then the penis soon becomes flaccid. There is no emission and the act terminates unsatisfactorily. Those who have practiced unnatural sexual excesses often suffer from this condition.

The size or consistency of the testicles is often extremely misleading. The most pronounced reflex disorders may occur when the testicles are apparently perfectly normal. Obliteration of the ducts which unite to form the vas deferens after a double gonorrhœal epididymitis often causes sterility, but does not affect the potency of the individual,

though dragging and stinging sensations in the testicles, groins and along the urethra are not uncommon during and after intercourse.

Psychical Impotence is that variety of impotence in which the sexual organs are capable of full erection when the patient is alone, excited by lascivious reading or thoughts, by stimulation of the erection centres of the nerve mass, or a full bladder in the morning, under certain mental impressions originating within or conveyed to the brain by the special senses, but when sexual intercourse is attempted the action of the sexual centres is, for the time being, inhibited, diminishing or suppressing the power of erection and ejaculation. Sometimes there is a diminution or absence of sexual desire with great shrinking of the organs.

Nervous or psychical impotence may depend upon an increased action of the inhibitory nerves brought about by unpleasant or excessive excitement of the brain. Through the action of these inhibitory nerves the organic muscular fibres of the corpora cavernosa contract and oppose the entrance of the blood into the cavernous tissue. Not infrequently, when not in a state of sexual excitement, the penis, though shrivelled, moves in a worm-like manner, due possibly to the action of these muscular bands in the corpora cavernosa, the penis being small, retracted, with wrinkled skin on the dorsum.

Few men have not at some period in their life, from excessive mental application, business worry, prolonged bodily exercise, etc., been transitorily in this state but with the subsidence of the cause the sexual power has righted itself.

Psychical impotence happens not infrequently in recent widowerhood. For a time, all sexual desire and interest in the opposite sex may be lost. Young men and frequently those advanced in years who have led a chaste and moral life, when first attempting intercourse, from over-anxiety,

nervousness, timidity, etc., sometimes find the erection fails when most desired. Those who have indulged excessively in masturbation or sexual excesses, particularly when they have been led astray by vicious literature or ill-advised counsel, are often the victims of this condition. Nervousness attending marriage, and fear of inability to perform satisfactorily the part of the husband, may incite temporary impotence. Young men who live a rather fast life, yet from fear of disease shun intercourse with women of the town, but who at some unguarded moment, when semi-intoxicated, attempt an illicit congress are often impotent. Owing to the inhibitory action of the alcohol ingested, the fear of the consequences or the surroundings, a strong mental impression is received through this physical failure, *i. e.*, a complete loss of confidence in the sexual ability which creates a possible future incapacity even under favorable conditions.

Psychical impotence may also be produced by the environments, *i. e.*, noises, peculiar odors, fear of discovery, mental thoughts, moral or otherwise; repugnance, fear of contagion, pregnancy, the general dress and physique of the partner, her general hygiene, condition of the genitalia, etc.

In the relative variety of psychical impotence, intercourse can only be accomplished satisfactorily with a woman of certain stature, a blonde, a brunette, one with auburn hair, or when she is dressed in a special manner. Again, intercourse may only be successfully performed when the mind is concentrated upon some absent but pleasing consort, or the erection may be perfect, but the gratification inadequate, due frequently to the want of real reciprocity on the part of the woman, who indulges in intercourse for financial reasons and poorly simulates emotions which are not present. Want of reciprocity on the part of a wife sometimes produces a seeming impotence, which, under changed condition, disappears. Perfect sexual congress is only possible under the conditions of mutual fascination.

Psychical impotence is sometimes a source of worry *and* anxiety to the unmarried, but a congenial and moral marriage favors a normal condition. At first there may be an occasional failure, but the final outcome usually establishes a satisfactory relationship.

Treatment.—The nervous impression associated with any sexual disability is usually so completely fixed that a favorable opinion relative to the sexual status and future health will not be accepted, unless, to a certain extent, it agrees with the preconceived conceptions of the patient. A most thorough and searching examination, which must include not only a careful local examination of the genitalia by all approved methods, but also a thorough general systemic investigation has its weight in strengthening the patient's mental attitude. All unnatural and unhygienic acts must be investigated, proper advice given and appropriate measures established. The general examination must include the past history, diet, sleep, hygiene, habits, recreation, amount of exercise taken, condition of the bowels and urine, the use of drugs, tobacco, alcohol, etc.

An extra-stimulating diet should be prescribed, including oysters, clams, eggs, fish, red meat, celery, asparagus, tomatoes, etc., with a little red wine at lunch and dinner. Tobacco should be avoided, as in some it inhibits the sexual strength. Fresh air and outdoor exercise are to be commended. Early marriage may be expedient but fornication never. Great tact must be used in guiding those suffering from sexual derangements and the mind strongly impressed with hopefulness of results. Such patients cannot be dismissed with a laugh in an attempt to lightly cast aside their preconceived opinions.

In the psychical form of impotence produced by the mental frigidity or indifference of the wives, and consequent flabby condition of the vagina and vulva, with the absence of encouraging reciprocity—which stimulation is of the utmost

importance in satisfactory intercourse—the husband should be encouraged, suitably treated and morally advised. A strong and frequently successful stimulant to sexual vigor is a strict command to avoid sexual thoughts or intercourse under any and all circumstances for a certain stated period. While under treatment for psychical impotence no trials of sexual strength should be allowed. When intercourse is first attempted, advantage should be taken of the morning erection, the act being precipitated without delay or preparation. A glass of wine is sometimes a successful stimulant. If local lesions are discovered, approved treatment must be instituted. Electricity applied through the Dommer's urethral electrode (Fig. 145) to the deep urethra is often beneficial. Ignatia



FIG. 145.—Dommer Urethral Electrode.

or Anacardium, depending upon the mental symptoms, is often efficacious, though all cases must be carefully individualized and the remedy prescribed according to the totality of symptoms.

Symptomatic Impotence.—Sexual impairment may be the result of general illness or be symptomatic of some cerebro-spinal disease or defect, occurring even when the sexual organs are free from pathological lesions. It may be a reflex of a local disease of the testicles, or the effect of certain drugs ingested. Anything which lowers the general tone and vitality of the body reduces sexual strength. In the general fevers the loss of sexual power is as much the result of toxic conditions of the blood and its poisonous effect upon the nerve centres as the anæmic state and consequent poor nutri-

tive supply. Digestive disturbances may produce symptomatic associated sexual weakness. In diabetes, the loss of sexual vigor and desire is pronounced. Sexual excitement, produced either by organic or functional nerve lesions, is often followed by profound and continued impotence. The testicles in health are supposed, in some way, to influence the degree of man's virility, and, when diseased, to weaken the generative efficiency; in what manner it is not known, though it is probably through the sympathetic nerves. This explains many of the symptoms which are present in atrophy of the testicles due to varicocele, as well as the mental depression and unbalancing of the mind which sometimes follows double castration or vasectomy when the testicles are free from disease. The removal of the testicles may cause impotence, though it is frequently many years in becoming complete. Tubercular, syphilitic and other growths of the testicles are often associated with impotence.

The prolonged ingestion of such drugs, as Alcohol, Opium and its alkaloids, Iodine, Iodide of potash, Lead, Camphor, Turpentine, Antimony, Bisulphide of carbon, Carbolic acid. etc., has a symptomatic influence, inhibiting the sexual power and desire. The use of tobacco, especially cigarettes, particularly when the smoke is inhaled, as well as the excessive use of coffee and absinthe, often produce impotence, all varying with the individual susceptibility, though one or two cups of coffee daily, in those who have no special idiosyncrasy, may act as a sexual stimulant.

Treatment.—This depends upon the cause, the eradication or removal of which is usually followed by a disappearance of the symptomatic condition.

Organic Impotence.—This may be partial, complete, congenital or acquired. It is due to absence, imperfect development, disease or traumatism of some portion of the male genitalia. These conditions, however, do not necessarily

cause sterility. Congenital absence of the penis is of rare occurrence. In the few reported cases there were other associated anomalies of development. Penes of rudimentary size are occasionally met with in children, though, as a rule, in the process of development they become of sufficient calibre to make satisfactory intromission. Phimotic conditions frequently stunt the growth of the glans and body of the penis. Acquired absence of the penis due to surgical removal, traumatism, or the outcome of destructive ulceration and accidental or designed strangulation, sometimes causes organic impotence. A seeming absence of the penis rendering intromission impossible, may be produced by a large overhanging abdomen, a large scrotal hernia, hydrocele, hæmatocele, varicocele or scrotal elephantiasis.

Congenital over-development of the penis may make intercourse absolutely impossible. This, however, is exceedingly uncommon. The hard œdema of the prepuce or glans penis following inflammatory phimosis, chancroid or chancre may make intromission difficult or even prevent coition. Elephantiasis of the penis, congenital aneurismal dilatation of the corpora cavernosa, or that acquired from violence, as well as varix of the dorsal veins of the penis, may prevent intercourse. A double penis, a congenital union of the penis to the scrotum, or a stunted, fibrinous frænum may cause organic impotence. Those afflicted with malformations of the genital organs, who have reached adult life, may be potent or impotent, depending upon the character of their anomalies. Incomplete organic impotence frequently results from disease or traumatism of the part, the distortion being sufficient in degree to prevent intromission except to a limited extent, as sometimes occurs after phagadema, syphilitic ulcerations, ser-piginous chancroidal ulcerations, gangrene of the skin and underlying parts, as well as extensive injury or burns, which in healing distort the penis, preventing expansion of the erectile tissues.

If the prepuce is long and the preputial opening narrow, smegma sometimes accumulates and hardens behind the corona glandis, interfering with, if not preventing, copulation. In China, preputial calculi are common, distorting the parts and making sexual congress impossible.

Vegetations on the glans penis occasionally develop to great size, and when large may impede intromission. Horny growths sometimes develop and make coitus impossible. Cancer of the male organs of generation may not at first cause impotence, but as the malignant process progresses intercourse is proportionately impeded.

In ossification of the penis, as the deposit increases the organ becomes more distorted, painful during erection and sensitive at all times, producing true impotence.

Sometimes in the tertiary and less frequently in the secondary period of syphilis, the penis is invaded by a localized infiltration or gummatous deposit, producing impotence. Frequently the deposit is confined to the corpora cavernosa, where it forms a sharply-defined nodule, or to the corpus spongiosum, where it may completely encircle the urethra, cause curvature, etc. If neglected, the syphilitic gumma will soften and degenerate into an abscess terminating in loss of tissue, with distortion of the penis, etc.

In addition to the above causes of organic impotence, there are many degrees of curvature of the penis impeding perfect sexual relations which may be congenital and due to a short frænum or corpora cavernosa, but more frequently they are the result of injury or disease of the corpora cavernosa, a deposit in the walls of the corpus spongiosum, a short frænum, the result of removal of too much tissue in circumcision, an over-dilatation of the urethra or internal urethrotomy, or an inflammatory phimosis or paraphimosis.

Psychopathia Sexualis. — Sexual perversion may be described under the following headings: Masturbation, con-

jugal onanism and sexual excesses, together with sexual paræsthesia, which is divided into heterosexual and homosexual perversions.

Masturbation. — This signifies the production of an orgasm upon one's self by friction of the genitalia. The mental and physical conditions caused by this habit have been, by the profession, greatly exaggerated, much to the financial advantage of the charlatan. Great injustice has been done boys collectively by the claim that it is a universal habit and that it is practiced to excess by a majority. Yet it is not to be denied that a large proportion have indulged in the act. From the study of the history of a large number of patients, there seems to be no question that the habit is only practiced to excess by those who have some local focus of irritation, as phimosis, adhesions of the preputial sac, retained smegma, thread worms, hæmorrhoids, stone in the bladder, etc. Sometimes the habit is established by nurses, who handle the parts to quiet the child. It occasionally originates from the accidental discovery by the child of a pleasurable sensation, when climbing a tree sliding down a banister, etc. The most common cause is initiation by older boys. The habit is not infrequent before and during puberty though it is not uncommon at any period of life. It is especially harmful when practiced to excess by the growing boy, whose sexual organs and nerve centres are immature and undeveloped. Fortunately in the majority of cases, the bad effect of the habit is discovered and discontinued. Onanism is undoubtedly due in many cases to nerve defects, as in epileptics, hydrocephalic infants, and those suffering with cerebral and spinal diseases.

The views of Sir James Paget seem to us to be wholly correct. He said that: "You may teach positively that masturbation does neither more nor less harm than sexual intercourse practiced with the same frequency with the same

conditions of general health, age and circumstances—that is, at any time before or at the beginning of puberty—masturbation is very likely to produce exhaustion, effeminacy, oversensitiveness, and nervousness, just as equally frequent copulation at the same age would probably produce them. Or, practiced every day, or many times in one day, at any age, either masturbation or copulation is likely to produce similar mischiefs or greater. And the mischiefs are especially likely or nearly sure to happen, and to be greatest, if the excesses are practiced by those who, by inheritance or circumstances, are liable to any nervous disease, to 'spinal irritation,' epilepsy, insanity or any other neurosis. But the mischiefs are due to the quantity, not to the method, of the excesses; and the quantity is to be estimated, in relation to age and the power of the nervous system." He further states that he has seen as numerous and as great evils consequent on excessive sexual intercourse as on excessive masturbation; but he has not seen or heard anything to make him "believe that occasional masturbation has any other effects on one who practices it than has occasional sexual intercourse, or anything justifying the dread with which sexual hypochondriacs regard the having occasionally practiced it."

Masturbation, if repeated to excess, produces hyperæmia of the bulbous and prostatic urethra, which in time becomes a true catarrhal inflammation, involving the veru montanum, the sinus pocularis, the prostate and the seminal vesicles, manifesting itself by the many and varied symptoms already described as peculiar to these local conditions. Usually there is an accompanying general relaxation and numbness or hypersensitiveness of the scrotum, the testes become soft and flabby, the skin of the penis dark and thickened, the prostate swollen and sensitive, and, if pressure is applied through the rectum, prostatic fluid is easily forced into the urethra. The

seminal vesicles are frequently hyperæmic, inflamed and distended. In the more severe cases micturition becomes frequent and incontinence or dribbling of the urine is not uncommon. The voiding of the urine is frequently accompanied by a severe burning sensation as though hot lead was passing down the canal, the act terminating with a flow of blood and constrictive pain in the prostate. The nervous lesions and neurasthenic manifestations are legion, as already enumerated under chronic spermato-cystitis and disorders of function of the generative organs of man.

When long-continued, masturbation undermines the constitution, destroys the true sexual feelings and so obliterates the sensitiveness of the genital organs that they are incapable of responding to the full delights possible from a normal marriage. Its victims become morose, timid, cowardly, the complexion sallow, eyes deep set, with defective memories, impaired circulation, cold and clammy hands and feet, etc. The habit cannot be long continued to excess without lowering the morale and lessening to a great degree the mental grasp and possibilities of the individual. The adult masturbator often presents no outward sign of his depraved act, though he is always a cowardly and poor specimen of humanity. Infantile masturbators are usually characterized by their irritable, peevish conditions, flabby tissues, lowered powers of digestion and assimilation.

Treatment.—The young masturbator must be told of the perniciousness of the habit and its serious consequences if continued. This advice should be given in a kindly way, persuasion and sympathy doing more than fear of punishment. The parts must be carefully and scientifically examined and judicious attention given to any point of irritation likely through reflex action to be a source of abnormal hyperæmia of the genitalia. In young children the knowledge should be imparted by the mother ; at a later period, by the physician.

Pure morals promote health and strength, give vitality to form, grace of action, keenness of intellect, continued energy, and lasting success, with years of life, while excessive and abnormal sexual acts and habits undermine the system, sap the constitution, exhaust the mental and physical system, and lead to early death or decrepit old age. Boys who have practiced or who are suspected of practicing masturbation should not be kept too closely at their studies, but should be encouraged to engage in out-door sports and exercises. They should be carefully watched and advised, and when the habit is discovered should not be allowed to associate too intimately with other children or to occupy the same beds with them. In young children the habit can generally be broken by tying the hands at night and watching them at other times. If nurses are suspected of handling the infant they should at once be dismissed.

Conjugal Onanism.—Some men in the endeavor to escape the duties of paternity, in ignorance of the evil effects upon themselves, indulge in unnatural coitus, *i. e.*, withdrawal, the use of a condom, etc. The practice is said to be quite common, general evidence indicating that it is most prevalent among the educated class.

It is true that many have for years indulged in conjugal onanism without seeming detriment, but there is no question that the performance of this unnatural act has ruined many and that others have fallen into the lowest depths of despair and ill health without the source being even suspected. Between these two results of the disobedience of Nature's laws there is every gradation of effect which may manifest itself at an early or remote period, depending upon the stability of the nervous and physical system of the individual.

Unnatural coitus not only produces local lesions of the sexual organs with consequent reflexes, but has a very decided effect upon the nervous system at large, causing deterioration

of nerve power, which if it does not manifest itself in the parent often shows itself in weakly nervous children who often present many of the symptoms which class them as pervers.

In a varying degree many of the following symptomatic conditions may appear: Loss of sexual vigor, premature and unsatisfactory ejaculations, pathological pollutions, erotic dreams and sexual erythism, pain and uneasiness in the penis frequently accompanied with some sero-mucous discharge, pain in testicles and spermatic cord often very severe; sharp or undefined pains in the back, groins, thighs, supra-pubic or femoral region and anus which may be burning in character. Increased frequency in micturition is of common occurrence; it may be somewhat painful, the pain being especially referred to the glans penis. With the local conditions there is an accompanying general weakness and lassitude, loss of flesh, pallor, physical and mental unrest, irresolute, irritable, despondent condition, with dyspeptic symptoms and constipation. As the disorder progresses, dull feelings in the head, ill humor, melancholia, loss of memory, etc., become more pronounced. At first these general symptoms are most noticeable in the morning, but finally they become ever present, with sharp pain in the heart, nervous palpitation, small, weak, feeble pulse, asthmatic attacks, painful spots in various parts of the body, especially along the spine and in the joints; sharp pains radiating around the body, sensation of constriction about the throat, with great weakness and profuse perspiration on the slightest effort, mental or physical.

Treatment.—All unnatural acts must be discontinued. A change of air and climate with relaxation from business cares will be of great assistance. Lachesis, Nux vomica, Rano bufo, Salix nigra, Staphisagria, Sulphur, etc., with local treatment for the lesions produced may be expected to give pronounced benefit.

Sexual Excesses.—Sexual energy varies greatly in different individuals. Immoderate indulgence for one may be moderation for another. The results of sexual excesses usually appear between the fortieth and fiftieth year. If the source of diminished sexual vitality can be discovered and removed, though there is frequently associated general disease or intemperate acts, much can be accomplished. Sexual intemperance, if continued only for a short time or indulged in occasionally, usually rights itself, as observed in the young or old recently-married man. Excesses are always to be condemned, and whenever they have produced sexual debility, if any part of the sexual tract is diseased, it must receive proper attention, its return to a normal condition frequently resulting in restoration of the lost capacity. At the same time it is well to impress the idea that the control of the sexual appetite adds strength of mind, bodily health, power and soundness of judgment, with length of life. If the inordinate appetite is gratified the commencing spermato-cystitis and prostatitis will become chronic, with the train of well-known symptomatic manifestations.

Parsæthesia Sexualis.—This is a condition which is somewhat prevalent, and, it must be acknowledged, is unfortunately on the increase. It is largely hereditary, often being forced upon the instinct of children born of a father who has allowed sexual habits to have the mastery, though many undoubtedly enter into these vile acts from association. The condition is unusual, unless hereditary weakness is present, and its victims are ripe for contamination. This class of perverts seem unconscious of their debased condition, some even glorying in their acts and taking pleasure in parading them. Masturbation is not so common among them as might be expected, many looking upon this habit as being very injurious, while they consider their own shameful acts special and commendable marks of superiority.

Paræsthesia Sexualis is divided, according to the perversions practiced, into heterosexuality and homosexuality. No attempt will be made to discuss this subject in full as it comes more particularly within the domain of the neurologist.

Heterosexuality is a class of sexual perversion which is characterized by association during coitus of acts of cruelty and violence, presenting itself either as an active or passive **algolagnia**.

Sadism, or Active Algolagnia, is that form of sexual debasement where the acts of violence are directed against the co-partner. It is more common among men than women. It is a frequent cause of uncontrollable and unnatural crimes, and was probably exemplified in the Whitechapel murders; also, in less degree, in those abnormal impulses in which ejaculation only occurs while the sadist is biting, scratching, or, in some other manner, inflicting pain upon his companion.

Masochism, or Passive Algolagnia, is the opposite to sadism. The sexual pervert experiences fleshly pleasure when he subjects himself to violence and cruelty, varying from the slightest to the most repulsive.

Homosexuality is distinguished by its lustful desires and instincts adverse to those which the sex would naturally indicate. It has the following varieties:

Psychical Hermaphroditism, characterized by a degree of inversion of sexual instinct with pronounced desire for sexual relations with members of the same sex, and an occasional desire towards the other sex.

Urnings are recognized by sexual desires and inclinations for persons exclusively of the same sex, with no desire for natural coitus. Those who have this form of sexual eversion are usually emotional and passionate, presenting sentimental attachments for those of their own sex which would be considered normal only between a man and a woman. They are usually unable to perform natural and successful copulation.

Mutual masturbation is common, and pederasty may afford the greatest sexual gratification.

Effemination and Virginité is characterized not only by inversion of the sexual instincts, but all feelings and inclinations in habit, sentiment and character are reversed. Coitus with the opposite sex is impossible. The man has the feelings of and acts like a woman.

Androgyny and Gynandry is a most extreme type of homosexuality. Not only are the feelings and sexual desires reversed, but the form, features and voice closely approach those of the opposite sex, and the genital organs frequently present anatomical signs of degeneration.

Treatment.—Mental suggestion, has been of apparent benefit after the physical defects have been removed by appropriate surgical methods. In two cases treated by an eminent New York physician, the most gratifying results were attained. All other forms and varieties of treatment have generally been unsuccessful, though it must be remembered that the indicated remedy has its reported cures.

Sterility.—As a twentieth to a fifth of all childless marriages are due to some sexual disorder of the husband, this condition should receive careful consideration. The inability to propagate one's kind is not necessarily accompanied by impotence. It may be due to the absence of or a diseased condition of the spermatozoa, to congenital or acquired obstruction or obliteration of some portion of the genital tract.

Sterility is classified for convenience of description, as Oligospermatism, Oligozoöpermatism, Azoöpermism, Aspermatism and Misemission.

Oligospermatism is that variety of sterility in which there is a deficiency in the quantity and quality of the seminal fluid. It may be due to the various anomalies of the genitalia or removal of the parts, but more frequently it is the result of disease. Excessive venery may, for the time being, impair the

quantity and quality of the seminal fluid ejaculated. In wasting diseases, in the feeble and those advanced in years, the quantity of spermatic fluid ejected is usually reduced. When the prostate fails to give its quota of secretion a thick seminal fluid results. Chronic inflammation of the seminal vesicles and ampullations of Henel may so modify the secretions from their respective glands as to produce thickening of the vesicular fluid, and the spermatozoa, though properly liberated, become agglutinated, or the seminal fluid may, on the other hand, become so diluted and watery in character that the spermatozoa are washed out of the vagina. This latter condition is sometimes the result of gonorrhœal vesiculitis. The spermatozoa contained in the seminal fluid may be of low vitality or lifeless, the admixture of pus from the deeper portions of the genital tract being a frequent cause of this condition, its presence giving a yellow or green color to the seminal fluid.

OligozoöspERMATISM is the class in which the ejected spermatic fluid contains comparatively few spermatozoa, owing to imperfect development of the testes, as in ectopy testis, or when there is a tendency to fibrous and malignant degeneration, temporary or permanent disablement of the testicles by epididymo-orchitis of any form—simple, tubercular, traumatic, gonorrhœal or syphilitic—producing obstruction in the conducting tubes by inflammatory changes. Syphilis often brings on this form of sterility without producing local lesions demonstrable by local or general examination of the parts, though, usually, there is a history of a specific orchitis or epididymitis, in which case the head of the epididymis is preferably involved. In gonorrhœal epididymitis the tail is usually attacked. Pressure exerted by hydrocele or hæmatocele may temporarily cause the process of spermatogenesis to cease, the function returning on the removal or cure of the cause. Varicocele is supposed to produce atrophy of the testicles, and may, therefore, cause oligozoöspERMATISM. With

advancing age it is a common condition. Nerve involvement and the ingestion of certain drugs, such as potassium iodide, the bromides, etc., have caused it.

Azoöpermism is that form of sterility where the seminal fluid does not contain spermatozoa, or, if present, they are diseased and unproductive. It may be due to a double occluding epididymitis, simple, syphilitic or tubercular orchitis, obstruction at any point of the conducting tubes of both sides, atrophy or absence of the testes, etc.

Sterility is often dependent upon a want of life and vitality in the spermatozoa ejected, the result of neurasthenia, masturbation or unnatural and ungratified sexual desires. Healthy spermatozoa should retain their life and vibratory motion for at least twelve hours after emission.

When azoöpermism is caused by inflammation and obliteration of the vas deferens the seminal fluid discharged will only represent the secretions of the seminal vesicles, prostate and urethral glands. It may appear normal in amount, be transparent, watery, and coagulate like normal semen, but contain no spermatozoa. If it is allowed to settle, large numbers of spermatic crystals will appear, the quick or tardy appearance of these crystals affording an inference to the fructifying power of the semen. If they develop quickly the spermatozoa contained in the seminal fluid are of low vitality. When the spermatic crystals appear late (on the second or third day) the fructifying power of the spermatozoa may be considered strong.

Aspermatism embraces that class of sterility where copulation is not terminated with the ejaculation of seminal fluid, the act in all other respects being normal. The sexual desire may be normal or absent. True aspermatism is uncommon, though a temporary variety is frequent, the patient having the ability to satisfactorily conduct intercourse but is unable to ejaculate semen. Aspermatism may be absolute or relative, temporary or permanent, congenital or acquired. The con-

genital and permanent variety are quite uncommon. They may occur without any local reason. Acquired aspermatism may be due to any temporary or permanent occlusion of the seminal ducts. The temporary variety generally happens in persons of a nervous temperament, who have suffered from venereal disease or have practiced sexual excesses. The relative variety is rare. Erection may be perfect and the act may even be prolonged until stopped by exhaustion without emission. A nervous form of aspermatism may also exist where the patient is unable to complete the act except with certain parties, due to imperfect co-ordination of the muscles of ejaculation. In some, there are occasional nocturnal emissions, but a complete failure of ejaculation when intercourse is attempted, owing to the above reason, or to a sensory paralysis. Aspermatism may be caused by obstruction due to a foreign body in the seminal ducts, pressure excited upon the urethra by tubercular, malignant and other growths, loss of tone of the muscles concerned in the act of ejaculation, or anæsthesia of the prostatic urethra or glans penis. It may occur without local pathological cause from want of lumbar reflex in the ejaculatory centers. In others there may be, under apparently the same conditions, ejaculation at one time and failure at another.

Misemission, also called false aspermatism, or male emission, is the condition where, although seminal fluid is ejaculated during the act, it is not deposited in the vagina, it passing back into the bladder to be either voided with the urine or to dribble from the meatus urinarius after relaxation of the penis and deeper genitalia. It may be due to hypospadias, epispadias, strictures or fistulæ of the urethra, etc. The prognosis and treatment vary with the local or general condition causing this misemission, which must be carefully searched for and treated.

Polyspermia is very rare. The amount of semen discharged may be three or four times the normal quantity, owing to increase of the fluid constituents.

SECTION XIV.

CHANCROIDS.

A chancroid or soft chancre is a contagious, virulent ulcer, which is both hetero- and auto-inoculable. Innumerable series may develop upon the same individual. One chancroid does not give immunity from future infection. It is a local disease and is never followed by constitutional disturbances, though there is a tendency to the associated development of a virulent bubo. Statistics show that they are of frequent occurrence in dispensaries and hospitals; less so in general practice.

Etiology.—Ducrey, Welanders and others have isolated and described a special micro-organism always present in chancroidal pus, associated with numerous pus-producing germs. They are thick, with rounded ends and central constrictions (much like dumb-bells), about one and one-half millimeters in length, often presenting chains or groups. They are not only found between the cells but in the protoplasm. They are examined as follows: After the discharge has been fixed upon the cover glass in the usual manner, it is placed for half an hour in the staining solution, *i. e.*, Boric acid, 5 per cent. solution, one-half ounce; Methylene blue, saturated aqueous solution, five drachms, and distilled water, six ounces; then washed, dried and examined with the 1-12 oil immersion lens. If the discharge from successive chancroidal auto-inoculations be carefully examined, it will be noticed that the bacilli increase and the other pus bacteria decrease, and that in the pustules of the third generation there will often be a pure culture.

A chancroid can only result from the direct application, accidental or premeditated, of chancroidal pus to the skin or mucous membrane, one chancroidal pus corpuscle being sufficient to give rise to the characteristic lesion. It is never the cause of a syphilitic infection unless it acts as the point of entrance for the true syphilitic virus, producing what is known as a mixed chancre.

A chancroidal ulceration cannot be produced by inoculation of the syphilitic morbid principle, by poisons of any kind, or the germs or pus of other diseases, though inoculation with the pus from acne or a furuncle will sometimes produce a sore simulating a chancroid. Filthy habits greatly facilitate the spread of the disease, and it is not to be questioned that unhygienic conditions have the power of transforming germs of an innocuous type, which are always present about the genitalia, into pus-producing germs, which may induce pseudo-chancroidal ulcerations.

Rottel has demonstrated that filtration of the chancroidal discharge removes all its noxious principles. This would seem to demonstrate that the destructive action of the chancroid is due to the germ itself and not to its toxins. When, through lack of proper cleaning, chancroidal pus is allowed to remain in the sulcus behind or on the glans penis and is covered by the prepuce for a sufficient length of time, it will, by corroding and macerating the mucous membrane, destroy the epithelium and open new points of infection. Furthermore, chancroidal virus has been deposited upon the vaginal mucous membrane and after a short time, by coitus, conveyed to a third party who developed the chancroid, the woman escaping infection. A similar condition may happen through a man with a long foreskin.

Soft chancres are often the result of auto-infection, the morbid material being carried by the fingers to various parts of the patient's body. The original chancroid is often

followed by numerous complicating ulcers, the result either of invasion of the surrounding tissues or from contact of the discharge with fissures or abrasions present upon the body at the time of the original infection.

Animals have been successfully inoculated and true chancroids developed, but their course has been comparatively mild, the resulting ulcer being small and healing quickly.

Pathology.—Chancroidal tissue is characterized by a small round-celled infiltration, somewhat limited in depth, though it may extend beyond the borders of the ulcer and invade the neighboring papillæ, which are covered with apparently healthy epithelium, and cause them to appear hypertrophied. The blood-vessels are increased in number, dilated, and exhibit in the adventitia an inflammatory infiltrate. The lymphatic vessels are increased in number and open into the ulcerations.

Clinical History.—There is no period of incubation, infection taking place at once. In two or three, sometimes not until seven or eight, days after inoculation, a well-developed chancroid appears. Generally numerous lesions are present, the characteristic feature—multiplicity—being due to new lesions, which generally appear successively from auto-inoculation and not simultaneously. The chancroids commence as small pustules, though usually the lesions are undiscovered until the pustules have ruptured, leaving ulcerated surfaces, which remain so until cured. Chancroids are usually round or oval in contour. They may follow fissures or abrasions of the skin; sometimes they are confluent. The inoculation of a cut from a hair often incites a linear chancroid, and an infected hair follicle results in a hard, round elevation resembling a small boil, which rapidly breaks down, forming the characteristic chancroidal ulcer.

Whenever chancroidal virus is deposited upon a large abraded or granulating surface, the lesion starts as a number

of **small** ulcers from different points, which gradually enlarge and coalesce, producing a scalloped margin of the edge of the **confluent** chancroid. They may become serpiginous, eating irregularly into the surrounding tissue by both superficial and **deep** erosion. The connective tissue is especially susceptible to the destructive action of the chancroid.

From their clinical peculiarities chancroids have been designated, as follows: Exulcerating chancroid, when it remains superficial; ecthymatous chancroid, when it is covered with a **thick** crust; follicular chancroid, when it first develops within a follicle and resembles a furuncle; *ulcus elevatum*, where there is an excess of inflammatory exudate, which not only elevates the involved tissue, but packs it so hard together that the parts beneath the ulceration simulate a true chancre; inflamed chancroid, when more than the usual inflammatory areola is present; in the diphtheritic chancroid there is little or no inflammatory action, it being painless, covered with a firmly adherent, yellowish-white membrane, accompanied by a thin, acrid discharge, and remaining active for weeks, when, without apparent cause, the membrane exfoliates and leaves behind a simple ulcer, which heals rapidly; phagedenic, when the virulence of the inflammation rapidly extends and is accompanied by sloughing of the involved tissue; gangrenous chancroid, when the tissue destruction is both rapid and extensive; and serpiginous chancroid, only present in a chronic condition, when the lesion slowly extends in one direction while healing in another.

Chancroids (Fig. 146) vary greatly in size; they are usually one-quarter to three-quarters of an inch in diameter, though those of the phagedenic variety may involve large areas of the penis, thigh, groin, scrotum or abdomen. The edges are sharp and perpendicular, as if punched out, though frequently they are everted from the undermining of the integument, the connective and muscular tissues being more easily destroyed

by the erosive action than the cutaneous. The base of the ulcer is worm-eaten and irregular, yellow, tawny, and sometimes red in color, covered by an adherent discharge and bleeds slightly on its removal. The discharge is *profuse*, yellow, creamy, greenish and sometimes bloody. The infecting quality of the pus remains until the chancroidal ulcer is



FIG. 146.—Chancroid and Complicating Inguinal Adenitis.

cured or robbed of its virulence by complete gangrene or artificial destruction by the stronger acids, which transform the chancroid into a healthy, granulating surface. Chronic chancroids, which are sometimes observed upon the genitals and around the anus of prostitutes, in time lose their virulent property.

If the ulcer has not been irritated by improper applications or dressings, it will rest upon a soft, slightly inflamed base. If it has been irritated, which is not infrequent, the area of inflammatory infiltration will be more prominent, and appear as an areola of thickening, which shades off into the surrounding healthy tissue. This inflammatory infiltration can easily be distinguished from the hard, firm, parchment-like feel of the true chancre, which has a sharply-defined border of induration, though when a chancroid has been cauterized and in some of the follicular varieties it is impossible to make a positive diagnosis without awaiting the constitutional developments. The chancroidal ulcer, when manipulated between the thumb and finger, appears soft and pliable, unless the inflammatory exudation has been considerable, when it will feel doughy and inelastic. Chancroids are painless unless irritated. The parts, however, generally become irritated from uncleanness, from their anatomical location and contact with the urine, and consequently often become very painful.

Chancroids may be situated upon any part of the cutaneous surface or exposed mucous membranes of the body, but they are generally located upon or around the genitals; the exception being notably the hands. On the head, face, arms and chest, chancroids run a rapid course, but never become well developed. On the thigh, large sloughing ulcers are prone to develop, but on the abdomen they are easily managed. They are usually located at points which are most liable to abrasions or injury during coitus. In men they are frequently situated behind the corona glandis, and from auto-inoculations are usually multiple. The same can be said of the surface of the prepuce and along its margins. They often occur upon the frænum and in the frænal sulcus. When the ulcer commences on the free edge of the frænum it tends to spread to the glans penis; when it is located in the sulcus it usually starts at one side and rapidly eats through and destroys

the frænum, sometimes opening up the frænal artery with resulting hæmorrhage.

Chancroid at the meatus may be located on either side of the commissure, or may surround it; when this happens it leaves, on healing, an open and gaping meatus. When the chancroid is situated on the glans penis there is usually present a corresponding one on the inner surface of the prepuce which covers it. When it is of the phagedenic variety it may eat into the urethra, especially if it is hidden from view by congenital or inflammatory phimosis.

Urethral chancroids are usually located in the canal a short distance from the meatus. If deep-seated they may be recognized by the local inflammatory swelling, pain, discharge, etc. Chancroids of the anus and rectum, from anatomical location, happen frequently in women. When present in this location upon a man they are considered evidence of sodomy.

The active period of a chancroid, when unirritated, is about four or five weeks, from which time its virulence decreases. This is recognized by the discharge becoming yellow and more profuse, granulations springing up and the ulcerated surface healing from the circumference to the centre (Fig. 147), leaving a whitish scar which may persist or after a time gradually disappear. Chancroids of the meatus, urethra, anus, rectum and posterior vulvar commissure are liable, from the exposure and the irritation to which they are subject, to become chronic and their bases indurated.

Clinically, in addition to the simple chancroidal condition, there are some diverse forms which may be due either to a cachectic constitution, inebriety, syphilis, tuberculosis, mode of life, debility from improper food, clothing, bad air, etc., to the location of the chancroid where friction is unavoidable or when the parts are exposed to heat, moisture, filth and discharges, etc., or are subjected to improper treatment. These forms require special consideration; not that the character of the virus is dissimilar but its results are different.

When chancroids develop beneath a tight foreskin or are



FIG. 147.—Healing Chancroid.

improperly treated, an associated phimosis may develop, the

infiltration so thickening the preputial opening and curtailing its distensibility that exposure of the glans penis and local treatment of the ulcer are impossible. It may also cause retention of the discharge, which undergoing decomposition increases the inflammatory condition, interferes with the circulation and weakens the tissue resistance, thus favoring auto-inoculation, burrowing of pus, gangrene, sloughing of the parts, and the development of an inguinal adenitis. Chancroids sometimes occasion swelling of the parts in those who have been circumcised, have a short foreskin, wear it well back behind the glans or have retracted the prepuce and cannot return or replace it (paraphimosis).

Gangrenous and phagedenic complications are often due to individuality, a broken-down constitution, excessive drinking, old age, chronic mercurial poisoning, mechanical irritation, coitus, and certain local applications, *i. e.*, mercurial and other fatty salves. Fortunately, from the better understanding of the disease and its treatment, these forms are now rare. Disturbances of circulation consequent upon phimosis, paraphimosis, etc., may also influence these complications.

A gangrenous condition may be engrafted upon any chancre. It is inaugurated with increased and often excruciating pain in the part with lessened discharge which becomes sanious; the areola of inflammation extends and the ulcer becomes dry and covered with a thick greenish, firmly adherent, black or dry scab. Suppuration soon commences, resulting, if the process has been complete and the granulating surface has not been reinfected, in a simple, ulcerating wound. When reinfection takes place the chancroidal process will be repeated. Chancroidal gangrene sometimes leads to enormous destruction of the surrounding tissues with marked constitutional disturbances, and death from hæmorrhage and exhaustion.

Phagedena or chronic gangrene, sometimes spoken of as

serpiginous chancroid, progresses slowly and often continues for months or years. It is not accompanied by the pronounced local or constitutional symptoms of acute gangrene. The real cause of this complication is unknown ; it seems to be due to a personal idiosyncrasy. The colored race are especially prone to it. The phagedenic chancroid spreads slowly, eating superficially through the connective tissue and dissecting out the blood-vessels and tendons. Sometimes it travels over a large surface of the body, over the abdomen, down the thighs. It may extend in one direction and heal in another. Sometimes it will commence at the prepuce and dissect up the skin of the penis, exposing not only the penis but the testes as well. It may finally heal without treatment, leaving much cicatricial tissue and consequent deformity of the parts.

Usually the lymphatic vessels leading from the chancroid to the nearest lymphatic glands escape contamination by the morbid principle ; when they do become inflamed those on the dorsum of the penis are generally involved and appear as thickened cords beneath the skin, the skin and underlying connective tissues being congested and thickened. Usually as the chancroids disappear these vessels return to their normal condition, though occasionally an abscess may form along the course of the involved lymphatic and ultimately discharge itself upon the surface of the penis and develop into a chancroid.

Lymphadenitis is the most common complication of chancroid, statistics showing that two-thirds of all chancroids are complicated by involvement of the nearest lymphatic gland. In the public hospitals one out of every four chancroidal ulcers is accompanied by a suppurating bubo ; in private practice, owing to the better aseptic care of the original lesion, a suppurating bubo is rare. The group of glands usually involved is that below Poupart's ligament and above the saphenous opening on the side corresponding to the loca-

tion of the chancroid. In one of a tubercular diathesis, the entire chain of lymphatics may be involved, swell to a great size and suppurate; and the resulting abscess cavity, if not properly evacuated, will spontaneously rupture at numerous points and discharge for months or years. The bubo may appear almost as early as the original lesion but usually between the second and the fourth week; sometimes not until after the chancroid has healed. The bubo is caused by the deposition, in the gland, from the lymph stream, of an irritant or toxin brought from an ulcerating chancroid.

Diagnosis.—A chancroid must be differentiated from the simple ulcerating abrasion, herpes, a follicular abscess, an erosion of balano-posthitis, a tubercular erosion and epithelioma. The simple conditions (mechanical abrasions, herpes, erosions of balanitis, etc.) bear no relation to sexual indulgence, are traceable to a debilitated condition of the system, certain nervous conditions, uncleanliness, traumatism or irritating discharges; they are not auto-inoculable; the lesions are superficial and soon yield to cleansing applications. Sometimes the simple lesions become irritated, ulcerated and simulate in many respects a true chancroid.

If the diagnosis is doubtful and the ulcerating surface cannot be exposed on account of inflammatory phimosis, or when the ulcer is situated deep in the urethra, it can usually be determined by auto-inoculation, which is performed in the following manner: A point on the chest just below the nipple, near the insertion of the deltoid, is selected. This location should always have the preference when the ulcer shows evidence of phagedena, experiments having demonstrated that in this locality the ulcer is least likely to become phagedenic after chancroidal vaccination. Some of the suspected pus is placed upon the tip of a perfectly aseptic bistoury, which is held at right angles to the body and the point introduced just through the skin, turned half way round and back again and

the surplus smeared over the wound. If the pus is chancroidal in character, in from twelve to twenty-four hours after inoculation a reddish blush of commencing inflammation, accompanied by a slight burning and biting, will be noticed at its point of entrance; by the end of forty-eight hours a small pustule, surrounded by an areola of inflammatory exudation, will develop. If this pustule be ruptured, a minute chancroidal ulcer, with sharp-cut edges, cup-like depression and worm-eaten base, covered with pus, will be exposed. If it remains unruptured, the pustule will in a few days dry upon the surface, the pus accumulating beneath will increase, and ulceration of the tissue will extend, constituting an ecthymatous chancroid.

When these small chancroids have served their diagnostic purpose they can easily be transformed into a simple ulcer by the application of a drop of Nitric acid and treated as such when the eschar produced by the acid becomes detached.

The differential points between chancre and chancroid are tabulated in the section devoted to syphilis. Sometimes differentiation is difficult and impossible until the time necessary for the constitutional manifestations of syphilis has elapsed. Not infrequently there is a dual or mixed infection, the chancroid appearing immediately and the chancre after the proper period of incubation. Papular syphilides of the ulcerating type which may appear upon the genitalia may be mistaken for chancroids, but the clinical history, the slow development and slight inflammatory symptoms will generally make easy the diagnosis. Ulcerating gummata without the clinical history would often be indistinguishable from chancroid, but the preceding gummatous deposit, their non-inflammatory nature and the luetic history will assist in a proper differential conclusion. Tubercular ulcerations, while uncommon, are indistinguishable by the physical signs from chancroids; they are usually associated with tubercular involvement in

other parts of the body, and microscopical examination of the scrapings of the ulcer may reveal the tubercular bacillus. Furthermore, about the periphery of the tubercular ulcer, grayish, transparent miliary tubercles are often present. Inoculation of a guinea pig may be necessary to substantiate the diagnosis. Epithelioma and other cancerous ulcerations may require a microscopic examination to verify the conclusion.

Prognosis.—When an acute lesion appears on the genitals of a healthy and cleanly individual it will usually pass through its course and heal, if complications do not occur, in from three to six weeks. When the chancroid becomes phagedenic or gangrenous there may be extensive destruction of the tissues, but death rarely occurs. In those broken down in health from any cause, or where improper treatment has been instituted, and in the gangrenous form of chancroid, complications and a protracted case may be expected. Chancroids of the meatus always leave cicatrices which distort the urethral orifice.

Treatment.—Includes the prophylactic, abortive, symptomatic and remedial. Prophylactic treatment would be feasible if it were possible to properly impress upon the masses the fact that the evil consequences of immorality might be greatly minimized by cleanliness but that immunity can only be guaranteed by the practice of personal hygiene and abstaining from wrong acts. Abortive treatment is, however, often successful. If, after a suspicious intercourse, a slight break in the mucous membrane or skin of the genitals is noticed, or the physician finds an overlooked abrasion on his hand or he has in some way punctured the skin while making a chancroidal examination, and it is within six hours of the time of the suspected infection, the morbid principle may be destroyed without injury to the epidermis. The technique is as follows: The suspected part is thoroughly

washed with hot water or a mild antiseptic solution, particular attention being paid to the folds of the skin around the *frænum*, and the abrasions treated by the application of a solution of Carbolic acid, 1-10, or Bichloride of mercury, 1-200; or best of all, cauterizing each abrasion with fuming Nitric acid. Nitrate of silver is never permissible. Finally by immersing the parts for ten minutes in a concentrated solution of Citric acid or for an hour or two in a weak solution of Sulphate of iron or Permanganate of potash.

Chancroids often disappear in from two to six weeks with cleanliness and mild antiseptics, *e. g.*, bathing the parts with soap and warm water, spraying with full strength Peroxide of hydrogen, followed by washing with a solution of Carbolic acid, 1-60, or Bichloride of mercury, 1-3000. Prolonged emersion of the chancroid and surrounding parts in a 1-4000 to 1-2000 Bichloride of mercury solution is not only beneficial but curative.

When the surface involved is not large or there is evidence that a healthy action is about to commence, Iodoform is one of the best applications, the only objection to it being its odor. It should only be applied to the ulcerating surface which should previously have been cleansed with a spray of Hydrogen peroxide and dried with absorbent cotton; Aristol, Iodol, Europhen, or Europhen-Aristol may be employed. Calomel, Boric acid or Salicylic acid, Oxide of zinc and Bismuth sub-nitrate have also been used with benefit. The latest antiseptic powder, Dermogen, has given excellent satisfaction, equaling Iodoform. It is white and odorless; Pyrogalllic acid, either as a powder, twenty parts to eighty parts of starch, or as a paste, in a 5 per cent mixture, acts well; it does not attack the healthy skin, but stimulates the chancroidal ulcer and will in time transform it into a healthy granulating surface. It should be applied night and morning and covered with gutta-percha tissue, and its application

continued until the granulations fill up the ulcer, after which Oxide of zinc should be substituted to complete the process of cicatrization.

Crusts must not be allowed to form over the chancroidal ulceration as they dam back the discharge and prevent the antiseptic and healing solutions and powders coming in contact with the diseased tissues. Sometimes where there is a great tendency to the formation of crusts over the chancroid, the various powders can be to advantage applied in the form of a paste made with Vaseline, etc. Dusting powders should be applied four to six times daily. They are only indicated when the inflammation is of moderate degree and the discharge is not profuse.

When deep infiltration of the tissues surrounding the chancroid has not occurred the abortive or escharotic treatment is often beneficial; in this method, Nature is imitated by producing a complete destruction of the diseased part; but if this form of treatment is imperfectly applied or some small point of infection is overlooked, the second state becomes from the auto-inoculation of the increased denuded surface worse than the first. Nitric and Sulphuric acids, the acid Nitrate of Mercury, Bromine, Iodine, Zinc chloride and the actual cautery are, from their easy application, the agents most frequently employed.

When the chancroids are small and few in number, after the parts have been thoroughly cleansed and the ulcerating lesion anæsthetized by a spray of Cocaine, 2 per cent., and Carbolic acid, 1 per cent., they can be destroyed by the actual cautery, which acts very satisfactorily. The tissue must be cauterized deeply enough to destroy all the chancroidal and the surrounding tissues for at least one-eighth of an inch, or until the parts are black and charred. After cauterization, the chancroids and surrounding parts must be again disinfected, the eschar dusted with Iodoform and

sterile cotton applied. In three to five days the eschar will be thrown off, leaving, if the cauterization is successful, a simple ulcer which soon heals.

Nitric acid is frequently employed as the escharotic. It can be applied as follows: The chancroid is dried with absorbent cotton or blotting paper, then cleansed thoroughly with Hydrogen peroxide, and again dried; the parts are now held so that the cup-like depression looks upward. Around the ulcer there should be placed a line of Vaseline to prevent possible overflow of the acid and unnecessary burning of the neighboring tissues. The ulcer is filled with a drop or more of the acid by means of a glass rod or stick and in a few moments it will turn white. The white eschar should be allowed to overlap the original edge of the chancroid, the superabundance of the acid is removed with absorbent cotton and a drop of Carbolic acid applied to the surface to control the pain. Finally the ulcer is dusted with Iodoform and covered, until the eschar comes off, with antiseptic gauze, when a dusting powder will be required.

When Sulphuric acid is employed it should be used as a Carbo-sulphuric paste, made by mixing Sulphuric acid with willow charcoal. The paste is applied to the dried chancroid and pressed well down into the irregularities of the surface, where it remains as a dry black crust which peels off after a few days, leaving a healthy granulating and occasionally a cicatrized surface.

Cauterization is indicated when there is no question about the diagnosis, where the ulceration is extending rapidly, or where it is becoming gangrenous, phagedenic or serpiginous in character. It is contra-indicated where increased local inflammation might induce a phimosis or paraphimosis, where the chancroid is much inflamed but not sloughing or where the lesion has passed through the virulent stage and has commenced to heal. Nitrate of silver, owing to its superficial

action, must never be applied as a caustic ; it is only useful as a stimulant, to hasten cicatrization of the large granulations.

Where the discharge from the ulcer is profuse and the disease assumes an inflammatory type or the business of the patient prevents proper antiseptic care of the parts, pledgets of cotton moistened with a solution composed of equal parts of Carbolic acid, 1-100, and Bichloride of mercury, 1-3000, or diluted Lead water may be applied and retained upon the ulcerating surface.

If inflammation follows any of the escharotic methods of destruction of the chancroidal tissue, it may be relieved by dressings of dilute Lead water combined with an equal amount of Alcohol or even cold water.

Rectal and vaginal chancroids should be treated by packing the parts after proper aseptic attention with Iodoform gauze. When located in the meatus urinarius they should not be cauterized, but a paste of Iodoform or Aristol should be pressed well into the parts, or the meatus plugged with a strip of Iodoform gauze. Sub-preputial chancroids should be cleansed by injecting every two or three hours by means of a flat-nozzled syringe, a warm saline solution followed by a solution of Permanganate of potash, one to ten grains to the ounce of water ; Nitrate of silver, five to fifteen grains to the ounce of water, or a mixture of Iodoform and Balsam of Peru. If the discharge becomes offensive it indicates a gangrenous tendency, and the glans penis must at once be exposed by a lateral incision of the prepuce, followed by the after-treatment already advised. This method of exposure of concealed chancroids is always advisable, infection of the wound never occurring.

If the chancroid is situated on the preputial margin of the foreskin, at the junction of the skin and mucous membrane, and there is no other or progressive involvement, the ulcer may be cleansed with Hydrogen peroxide, cauterized and a

circumcision performed. The objection to this method of **treatment** is that the line of incision is often infected even **when** the most perfect antiseptic methods are observed.

Paraphymosis resulting from a chancroid often necessitates **relief** by division of the constricting band of tissue. The **wound** is douched with an antiseptic solution and dusted with **Iodoform** or **Dermogen**. Infection rarely if ever follows and the wound heals rapidly. Before the operation is performed the original chancroid should be cleansed and cauterized.

Gangrenous chancroids require careful removal of all obstructions to free circulation, whether organic or inflammatory, either by surgical incision, hot fomentations, or both. When of the inflammatory variety, twenty to thirty thicknesses of gauze saturated with a solution of Bichloride of mercury, 1-3000, and enveloped in oiled silk, changed every hour, act well. The parts should be elevated and the patient kept in bed. Sometimes continued immersion of the parts in a weak antiseptic solution, or where drainage is essential, a continuous bath in a mild antiseptic solution, may be required to stop the inroads of the disease. When slough occurs its removal may be hastened by the application of a charcoal poultice or by fomentations of a weak solution of Permanganate of potash or Bromine, 1-500.

Excellent results are obtained from Pyrogallic acid or the Carbo-sulphuric paste, the application every two or three days of pure Carbolic acid, or from Camphor and Iodoform dressings. Sometimes it will be necessary to employ the actual cautery, or to curette the parts, open up sinuses, and apply Nitric acid to the exposed surface. The system must be built up by good, substantial food, fresh air, etc.

Chronic phagadenic and serpiginous chancroids, while often curable by the local methods already outlined, are occasionally rebellious to local treatment until the properly-selected remedy is administered. This is particularly true in those

having syphilitic or tubercular antecedents. In others *only* a complete change of air and surroundings will give desired results. In a small number of cases, notwithstanding all treatment, great destruction of tissue occurs before the disease seems to wear itself out.

Mercurius solubilis is particularly beneficial in simple chancroid with a dirty lardaceous base. Mercury in some form is generally symptomatically indicated and when administered, materially hastens resolution and prevents complications. Cures have been reported made with *Argentum nitricum* and *Jacaranda* without local treatment. Complications may call for *Arsenicum album*, *Thuja*, *Sulphur*, *Lachesis*, *Hepar sulph c.*, *Hekla lava*, *Nitric* and *Sulphuric acid*, *Silicea*, etc. *Syphilinum* and *Tuberculinum* should be given when indicated. See Carleton and Coles symptomatic index for special symptoms.

SECTION XV.

SYPHILIS.

The term syphilis originated in 1530 with an Italian physician by the name of Fracastor, who derived it from the Greek, *σύν* and *φιλία*, *i. e.*, the companion of love. Syphilis is a specific contagious disease, of an acquired or congenital origin and of a chronic nature. It varies greatly in duration and intensity according to individuality and treatment. That it has existed from the most ancient times is evidenced by antiquated writings, together with prehistoric bones which bear unmistakable marks of syphilitic involvement. The Japanese and Chinese historians of several thousand years ago, as well as European writers of the thirteenth century, give accurate descriptions of its various manifestations. In Europe during its early existence, it was particularly virulent in its ravages. Toward the end of the fifteenth century it was called the "American disease," as it was at that time believed to have been introduced into Europe by the sailors who shipped with Columbus. Unbiased investigation has, however, relieved the Columbian expedition of this odium, as the disease was quite prevalent in Spain before the departure of Columbus. It was only coincident with his great discovery that it appeared and spread through Europe, largely owing to the general ignorance of its character and treatment. While there is no traditional history that syphilis was prevalent among the American Indians, human bones found in many of the ancient burial mounds in the southern states present evidences of syphilitic involvement (nodes, osteitis, caries

and necrosis), the disease was probably brought to this country centuries ago by some of the nomadic Asiatic tribes. To-day, no nation is exempt, and syphilis is present in all parts of the world. It is more prevalent in warm climates, where it is virulent, while in the temperate zone it is moderate in its manifestations. All classes are subject to it; social position is no bar to infection.

Etiology.—Syphilis emanates without doubt from a specific microbe which is introduced into the system either by inoculation and is followed by a chancre at the identical point of entrance and later by constitutional symptoms (acquired syphilis), or by transmission from father, mother or from both, manifested only by constitutional and late symptoms (congenital syphilis). As the morbid principle is not corrosive, infection can only occur when the epidermis or the epithelium has been penetrated or removed. Secretions from the original chancre, exudations from secondary involvements and the blood of syphilitics during their constitutional period have the power to cause, when they come in contact with the abraded surface of a susceptible human being, the disease designated as syphilis. As a rule, the blood and discharges from open lesions become innocuous after the second year. After the third, the morbid power is very slight. Sometimes specific lesions continue to display themselves for several years after they have lost their power to infect. The chimpanzee is the only animal which has as yet been satisfactorily inoculated. The physiological secretions, milk, perspiration, saliva, tears and spermatic fluid, unless they contain blood, epithelial or endothelial cells, are free from inoculating properties. Vaccine virus taken from a syphilitic may be perfectly healthy if free from blood corpuscles, epidermis, etc., but the dangers of contamination are so great that it should never be employed. An infant may nurse from the breasts of a syphilitic wet nurse who has mucous patches on her nipples

without becoming inoculated so long as the mucous membrane and skin surfaces in and about its mouth remain intact, but if a break in the continuity of either occurs a chancre will appear, to be followed after the proper period of incubation by the general manifestations of syphilis.

Syphilis was at one time believed to be caused by the bacillus of Lustgarten, which resembles greatly the bacillus of tuberculosis, but differs from it in having form two to four knob-like enlargements at its extremities, and in being sometimes bent like the letter S; it is from two to seven one-thousandths of a millimeter in width, and has been found within the round cells of the primary induration as well as in syphilitic growths and gummata.

In recent search for the bacillus of syphilis De Lisle and Julien have found in the plasma of the blood before it coagulates a bacillus of a polymorphous nature, varying from a short bacillus to an elongated filament, mobile in character and colored by the ordinary stain. These bacilli are not present in the plasma of the non-syphilitic. The bacillus becomes innocuous when the blood coagulates.

Syphilographers are unanimously of the opinion that a bacillus produces the various manifestations called syphilis, as only upon this supposition can the various clinical symptoms be explained, but further investigation will be necessary for an acceptable conclusion.

At the present time the disease is rarely seen in its virulent form; whether this is due to acquired partial immunity, as advanced by Esmarch, remains a mooted question. One attack of syphilis usually affords protection for life (acquired immunity), yet there are authenticated records of second invasions in which it resembles other contagious diseases. Acquired syphilis rarely occurs in those who have inherited syphilis from one or both parents (Profeta's immunity), or in a mother who has born a syphilitic child without apparent infection (Colles' immunity).

Infection may be either mediate or immediate; therefore, syphilis does not necessarily indicate immorality of the person affected. Immediate infection is usually the sequel of sexual intercourse or some immoral act consummated with a syphilitic, though it often follows a kiss or a wound afflicted by the teeth of one infected with lues. Hence, specific immediate infection of the system may be either vicious or innocent. Mediate contagion is almost always innocent, originating in some neglect of antiseptic precautions on the part of the surgeon, the use of infected cups, spoons, towels, clothing, pipes, cigars, humanized vaccine virus, unclean barbers' utensils, etc.

An innocent and blameless source should be ascribed to all extra-genital chancres with the exception of a small percentage of those of the lips, tongue, mouth, pharynx and anus. It has been estimated that 10 per cent. of all chancres occurring in men and almost 50 per cent. of those in women are of innocent origin. The large percentage in women is due to the fact that virtuous wives are often infected by syphilitic husbands.

The chancre in the acquired form of syphilis is always the first manifestation or distinguishable lesion. It is usually located on or about the genitals, though it may appear on any part of the body—the lips, tonsils, face, fingers, nipples, anus, etc.

Pathology.—The departure from health which occurs during the secondary incubation and in the early part of the constitutional period of syphilis is largely due to poisoning of the system by the toxins of the specific micro-organism. The pronounced secondary symptoms depend upon the infiltration of the lymphatics and the smaller blood vessels with an overgrowth of cells, the late secondary lesions being due to the destruction of tissue caused by obstruction of the lymphatics and small blood vessels, and the necrobiosis resulting

from pressure of the new growth upon the blood-carrying vessels with their consequent obstruction.

Clinical History.—The clinical picture of syphilis seems to depend as much upon the bodily resistance of the infected individual, as upon the morbid principle inoculated. When a luetic infection occurs in an individual who has been depleted by chronic alcoholism, scrofulosis, tuberculosis, malaria, pregnancy, etc., a severe form of this disease may be expected. Fatigue and excesses of all kinds tend to increase the number and severity of its manifestations, this being especially true of brain workers and those of emotional tendency and habit. Sometimes the disease reveals itself only as a chancre followed by a slight adenitis. This may possibly induce a sense of security and lead to neglect of proper treatment, though it may be followed in later years by gummatous growths with their unpleasant sequences. In others, a primary roseola, involving the skin and mucous surfaces of the mouth, of short duration, may be added. Again, the chancre may assume a malignant type, invade and destroy a considerable portion of the tissues in its immediate proximity and be followed by specific fever, anæmia, rheumatism, cephalalgia, etc.; during the early constitutional period, some of the various skin lesions which may occur may become pustular, ulcerate and excavate deeply, even involving the adjacent cartilage and bony structure; the abdominal viscera and the nervous systems may also become involved; recurrences of the local lesions may be frequent. Between these two types there are all gradations of the disease.

For convenience of description, certain stages or periods are recognized, *i. e.*, the primary incubation, which is the period intervening between inoculation and the appearance of the chancre; it varies from ten to ninety days. The primary stage varies from three to ten days, during which time the chancre develops and the anatomically associated lymphatic glands become hard and swollen. The secondary

incubation is the period between the appearance of the chancre and the onset of general constitutional disease; it varies from five to six weeks. The secondary or constitutional stage includes the succeeding twelve to eighteen months, during which in varying degrees appear anæmia, syphilitic fever, neuralgic and myalgic pains, lesions of the skin and mucous membranes, early nerve involvement, etc. The following two to four years are known as the expectant period during which time no evidences of the disease may be manifest, or, if present, they are moderate in degree and transitory in nature. The expectant period terminates in full recovery or in a tertiary or sequellæ period, in which diffuse infiltration with a round cell mass and resulting gummata occur in various tissues of the body as well as in some of the internal organs. Gummata generally happen during the third or fourth years, though they may develop in the early months of the disease, or, in those who have neglected proper treatment, after years of apparent health.

Primary Incubation.—The chancre appears at the original site of the entrance of the morbid principle in from ten to ninety days after inoculation, the average period being twenty-one days. During this time there are no local or constitutional disturbances. The parts present no characteristic abnormality unless the wound is kept open by uncleanness or some inflammatory process. The surgical removal of the point of entrance and the tissues adjacent to the wound will not prevent the appearance of the constitutional disturbance, even if it does sometimes inhibit the development of the chancre.

Primary Stage.—The primary lesion or chancre varies with its location and with the amount of irritation to which the parts upon which it is located are subjected. It generally appears as a small erythematous spot which in a few hours becomes a superficial papule. This papule gradually extends in circumference and depth, necrosis occurs and an erosion or ulcer forms.

The primary syphilitic sore is characterized by its induration which is always present at some period of its existence. The induration may exist only a few days, or it may remain for years; it may commence before the erosion or ulceration and be the first indication of the disease. Some authorities are of the opinion that the induration always precedes the open sore unless the chancre itself is preceded by some ulcerative process. There are, however, recorded histories of chancres in which the induration was never discovered. The characteristic induration of the chancre and the other syphilitic lesions are due to a cellular infiltration of the connective tissue and the walls of the minute capillaries. This infiltration obstructs the calibre of the vessels, diminishes the supply of blood to the parts and molecular death (superficial erosion) results. The degree of induration depends upon the anatomical location of the involved capillaries. When only the superficial papillæ are involved, a laminated or parchment-like induration results. When the network of vessels beneath the derma is included, a hard nodular induration of varying degree occurs, which corresponds in size to the involved capillary sphere.

The induration may be so thin that it is recognized only by pinching the parts between the thumb and finger, giving the impression of a disk of writing paper (laminated induration), or the sensation of a layer of leather or parchment exactly underlying the chancre or a portion of it (parchment induration), (Fig. 148). Occasionally the induration is confined to the marginal circumference of the chancre giving the sensation of a hard ring with a soft centre (annular induration). In these three forms, only the superficial vessels and tissues are involved. They are the usual form of induration. When the deeper vessels and tissues are invaded by the specific new growth, there will be a hard, elastic, sharply-defined induration, which may not only underlie the induration but extend down into the tissues underneath (nodular induration).

Chancres vary from one-eighth to three-quarters of an inch in diameter. They may heal in two weeks; sometimes not until after the secondary symptoms are well developed. They are



FIG. 148.—Chancre, Parchment Induration and Erosion.

free from pain unless irritated or inflamed. Generally, there is only one point of entrance of the specific virus, hence, one lesion only; but the lesion may be multiple if a number of abrasions were present and simultaneously infected, or a second

infection occurred before the development of constitutional **infection** from the first chancre. When this happens each

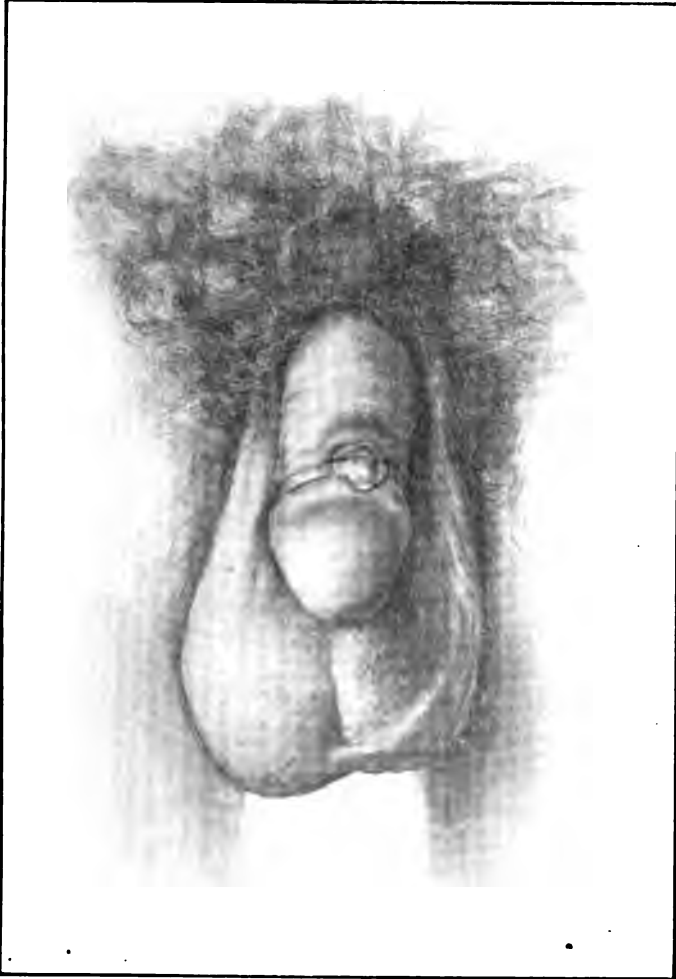


FIG. 149.—Chancre Covered with a Grayish False Membrane.
chancre will follow its own course. Auto-inoculation cannot

take place after the beginning of the secondary period **except** possibly after the disease is well advanced into the third or tertiary stage.

A chancre may appear as an abrasion, erosion (Fig. 148), fissure or a superficial ulceration, covered by grayish or yellow false membrane (Fig. 149). It is generally well-developed by the fifth to the tenth day, and fully formed by the fourteenth day. The lesion covering the induration varies with the anatomical location of the chancre; it may be round, oval



FIG. 150.—Chancre of the Penis.

or irregular in form. On the skin or dry part of the mucous membrane, the chancre appears as an indurated papule, sometimes slightly elevated, and of a deep wine-red color. After a few days it becomes covered by a scaly crust, which in time drops off, and if exposed to moisture erosion will take place. Chancres situated on mucous membranes are usually erosions. This variety constitutes three-fourths of all chancres. The erosion of the chancre is due to a true necrobiosis.

The surface of the chancre is usually denuded of its epithe-

lium, and is dark red in color or it may be very dark or gray, somewhat glistening, with possibly a small grayish membrane adhering to its centre and exuding a serous or sero-purulent



FIG. 151.—Hunterian Chancre.

exudation (Fig. 150); this discharge is scanty and does not contain pus unless the sore has been irritated. The erosion may cap a slight parchment induration on the prepuce, the back of the corona, in the meatus, or a large indurated

mass upon the lips, etc. When the vitality of the patient is at a low ebb or the chancre has been irritated or inflamed, ulceration will occur with the development of a Hunterian chancre (Fig. 151), with its associated hard, woody and elastic induration, extending far beyond its edges. Hunterian chancres are characterized by adherent edges, which slope down into the induration at the centre and give a funnel-like aspect which obtains in no other form of ulceration. The edges always slope toward the centre and are never undermined or sharp cut as in chancroid. They are round or oval in contour; the base is often grayish and exudes a sero-purulent fluid; when extra-genital they may become as large as a silver half dollar.

The Multiple-Herpetiform or chancre of Dubuc resembles in many respects herpes progenitalis, but it does not have the multiple circinate margin or the exudation of the latter. This form of chancre occurs when a number of points in the foreskin are simultaneously infected. A primary lesion, known as the "silvery spot," is sometimes the initial lesion; it appears as a white circumscribed film on the glans penis. It usually gives place in a short time to an erosion. The diphtheroid form also deserves mention.

A Mixed Chancre results when the syphilitic principle is engrafted upon a chancroid or the syphilitic virus is introduced into the system of one not immune with the chancroidal virus. When this happens the character of the lesion during the first three weeks does not differ from the usual chancroid (in fact, the chancroid may run its usual course and heal perfectly), but after the usual period of incubation of syphilis the sore becomes indurated and assumes the characteristics of a true chancre.

Urethral Chancres frequently escape recognition. They develop upon the mucous membrane of the urethra, and are usually located either at the meatus or within the anterior

inch and a half of the canal. The induration of the chancre may be discovered, by palpation of the penis along the course of the urethra, and the diagnosis confirmed by the characteristic specific glandular involvement, the urethroscopic investigation, the history of incubation and the microscopic examination of the discharge. Chancres of the cervix uteri, while undoubtedly often present, for want of proper examination and the fact that they produce no special pain or any noticeable increase of vaginal discharge, are frequently overlooked. They are generally located at the margin of the os and may present the general character of chancres occurring elsewhere, though, owing to their location, induration cannot be demonstrated.

Extra-Genital Chancres.—Chancres not associated with the genitalia are not uncommon, though their extra-genital location and unexpected development often militate against their early recognition. When a sore upon the general surface of the body refuses to heal under the usual forms of treatment, and examination reveals a circumscribed eroded surface, from which oozes a slight muco-purulent fluid that tends to form a thin crust, and the nearest associated lymphatic glands are at the same time painlessly enlarged, extra-genital chancre may be strongly suspected. As some locations are especially liable to be involved they have received distinctive names and will receive special notice.

Chancre of the Head and Face.—Razor cuts upon the face, which after they have healed re-open and become covered with a thin crust; painless cracks and fissures, surrounded by an inflammatory swelling, about the nose and mouth, which refuse to heal and exude a thin blood-stained serum and show a tendency to form crusts, together with acneiform pustules may be of specific origin and deserve careful consideration. Chancre of the face often occurs without accompanying induration. It may commence as a flat pustule surrounded by an inflam-

matory but non-indurated base, and resembles very much multiple erythema. When the crust is removed a flat, glazed slightly depressed ulceration remains. This form of chancre is common on the hairy parts of the face and the scalp. The chancre may also develop as an indurated papule or erosion which slowly extends in circumference. Either form is accompanied by painless enlargement and induration of the nearest lymphatic glands, and is followed by the usual constitutional symptoms.

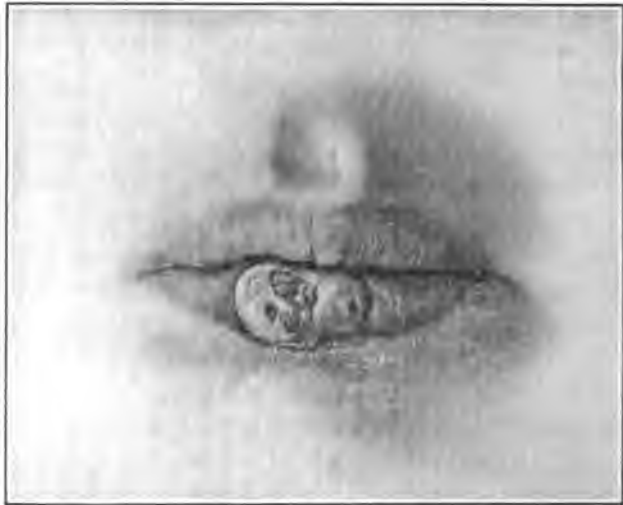


FIG. 152.—Chancre of the Lip.

Chancre of the Eyelid and Conjunctiva.—A chancre in these locations is often mistaken for a sty. It commences as a papule, gradually becomes eroded, ulcerated and indurated, and is accompanied by enlargement of the lymphatic glands in front of the ear and at the angle of the jaw.

Chancre of the Lip.—It may resemble at first, or commence as, a fissure, an aphthous lesion or herpetic ulceration, which

in a few days becomes greatly indurated. It is accompanied by a varying degree of congestion and swelling (Fig. 152), followed in one or two weeks by painless induration of the sub-mental lymphatic glands.

Chancre of the Tongue.—This lesion appears as a painless round or oval erosion one-quarter to three-quarters of an inch in diameter, located upon a parchment-like induration, with a smooth surface, sometimes covered with a pseudo-membrane. Occasionally a deep induration of the Hunterian variety is present. The lesion is generally located upon the tip, side or anterior half of the dorsum of the tongue. The supra-hyoidean and sub-mental lymphatic glands or those just behind the symphysis of the lower jaw are first associatedly involved.

Chancre of the Tonsils and Fauces.—While somewhat rare, chancre upon the tonsils or fauces will be recognized as an indurated, eroded patch, the induration being easily demonstrated by pressing the parts between one finger in the pharynx and the other on the external surface. They rarely heal until treatment for the constitutional effects is well under way, and are often overlooked until secondary symptoms have appeared. All of the author's cases have occurred in women.

Chancre of the Breast.—The early recognition of a chancre in this location is of special importance because it is often overlooked owing to its simulating malignant conditions. It usually occurs in nursing women, though men have been affected. When a lesion on the nipple continues to extend and will not heal under the usual medication, exudes a thin mucopurulent fluid which tends to crust, with associated induration of the underlying tissues and painless enlargement and induration of the axillary lymphatic glands, it is more than probably of luetic origin. Often chancres on the nipple or breast do not differ in their physical signs from similar lesions on the genitals.

Chancre of the Anus.—This variety is extremely uncommon and rarely occurs except in women. The sore usually appears as an elongated, indurated and excoriating linear lesion presenting a marked cup-shaped destruction of tissue, and is located generally at the anal margin in one of the natural folds caused by the sphincter. It always induces the characteristic enlargement of the inguinal glands.



FIG. 153.—Chancre of the Finger.

Chancre of the Extremities.—When situated on the extremities (with the exception of the fingers), chancres differ in no special way from those on the skin of the genitals. When situated on the finger, digital chancre (Fig. 153), it develops slowly and painlessly as a papule, pustule or erosion at the base or side of the nail, soon becoming indurated, elevated and ulcerated, with only a slight discharge, the associated inflammation giving it somewhat the appearance of an ulcerating felon. After a few days the axillary or epitrochlear glands take on the characteristic painless induration, which remains until the constitutional medication is instituted.

Vaccination Chancre.—While formerly chancre sometimes unexpectedly developed after the use of humanized virus, it does not follow when bovine virus is employed, though it must be said that the latter will often arouse a dormant syphilitic condition.

Chancres sometimes become reindurated and erode or ulcerate on the advent of the secondary manifestations; if the ulceration or erosion has not healed before the advent of the constitutional period the chancre may granulate without losing its induration, become covered with a whitish filament, and

finally be converted into a mucous patch. Again the papillary layer of the skin in the chancre may proliferate, giving rise to a vegetation, or a broad condylomata covered with a gray adherent pedicle. It may become phagadænic with rapid destruction of tissue, or it may take a more chronic and serpiginous course. The latter condition is rarely seen outside of hospitals and generally occurs only in those who are undermined by disease or dissipation; it may, however, happen to those enjoying the most robust health.

DIFFERENTIAL DIAGNOSTIC POINTS OF CHANCRE, CHANCROID
AND HERPES PROGENITALIS.

CHANCRE.	CHANCROID.	HERPES PROGENITALIS.
<p>1. Character: A general blood disease, originating from an inoculation with the syphilitic morbid principle.</p> <p>2. Incubation: Ten to ninety days, usually about twenty-one days.</p> <p>3. Cause: Sexual intercourse with another having primary or secondary syphilis; the accidental or premeditated introduction into the system of the syphilitic virus through an abraded or punctured mucous membrane or skin.</p> <p>4. Situation: Most frequently upon the genitals, but it may occur on the lips, face, tonsils, hands, in the rectum, or on any other part of the body.</p>	<p>1. Always a local disease. The general system is never involved. Always originating from inoculation by chancroidal discharges or some other virulent pus.</p> <p>2. Develops rapidly. Ulceration commences immediately after the absorption of the virus. The ulcer may be well developed by the third day. Rarely commences later than the seventh day.</p> <p>3. Sexual intercourse with one having a chancroidal lesion. Inoculation by accident or design upon any part of the body. The specific bacillus usually can be isolated.</p> <p>4. Usually on the genitals, rarely extra-genital, but no part of the body is exempt.</p>	<p>1. Sometimes a local disease; often a neurosis.</p> <p>2. No period of incubation.</p> <p>3. Mechanical irritation, sexual congress; chemical irritation; acrid leucorrhœal or other vaginal discharges; a sequence of cold, fever or as an essential neurosis.</p> <p>4. Of frequent occurrence upon all parts of the genitals, particularly upon the inner surface of the prepuce and glans.</p>

DIFFERENTIAL DIAGNOSTIC POINTS OF CHANCER, CHANCROID AND HERPES PROGENITALIS.

(Continued.)

CHANCER.	CHANCROID.	HERPES PROGENITALIS.
<p>5. Number: Usually one, but they may be multiple from the same inoculation, though always multiple from the beginning.</p> <p>6. Commencement: It begins as an erosion, papule, or tubercle. It remains an erosion or ulcerates if irritated or inflamed.</p> <p>7. Form: Round, oval or symmetrically irregular.</p> <p>8. Edges: Sloping from the circumference toward the centre. Edges adherent, sometimes prominently elevated.</p> <p>9. Lesion: Generally flat, capped by an erosion or superficial ulceration, sometimes presenting a deep funnel-shaped ulcer with sloping edges (Hunterian chancre), sometimes a dry, scaly papule.</p> <p>10. Surface: Smooth and shiny, sometimes with a grayish pedicle in the centre, or covered by a crust.</p> <p>11. Secretion: Slight, serous or sero-sanguineous. Suppuration absent unless induced by irritation.</p>	<p>5. Usually multiple from its origin or from auto-inoculation; if not cauterized they may become confluent.</p> <p>6. It begins as a pustule or ulcer and always remains an ulcer.</p> <p>7. Round, oval, or unsymmetrically irregular, following creases in the skin, and with borders forming the segments of large circles.</p> <p>8. Edges sharp-cut, as if punched out, everted or undermined.</p> <p>9. Always a true ulcer presenting an excavation.</p> <p>10. Uneven, irregular, worm-eaten and without lustre, covered sometimes by a grayish pultaceous slough, or warty growth.</p> <p>11. Suppurates profusely.</p>	<p>5. Generally multiple, appearing simultaneously and by successive crops of vesicles; sometimes confluent.</p> <p>6. Begins as a group of vesicles, rarely as a single vesicle and may become an ulcer.</p> <p>7. Irregularly rounded with borders presenting segments of small circles left by the confluent vesicles. There may be only one circular vesicle. There are usually neighboring groups of vesicles which assist in diagnosis.</p> <p>8.</p> <p>9. Ulcer superficial, one or a group.</p> <p>10. Superficial granulations, sometimes covered with a superficial membrane.</p> <p>11. Moderate secretion; on squeezing a small serous drop appears.</p>

**DIFFERENTIAL DIAGNOSTIC POINTS OF CHANCRE, CHANCROID
AND HERPES PROGENITALIS.**

(Continued.)

CHANCRE.	CHANCROID.	HERPES PROGENITALIS.
<p>12. Color: Deep wine-red, gray, black, livid, sometimes scaly. occasionally scabbed.</p> <p>13. Induration: Constant; may be parchment-like underlying the erosion, or a marked induration dipping deep into the tissue and possibly extending beyond the erosion or ulceration. It is elastic, woody, and does not shade off into the surrounding tissues, but is sharp and well defined. It may disappear in a few days, but it usually outlasts the sore and may remain for years.</p> <p>14. Inoculability: Not auto-inoculable unless secreting pus. Not hetro-inoculable.</p> <p>15. Sensation: Not painful.</p> <p>16. Phagedæna: Rarely becomes phagedænic.</p> <p>17. Transmission: Not generally transmissible to animals.</p> <p>18. Invasion: No tendency to invade neighboring parts; the sore soon becomes circumscribed.</p> <p>19. Course: Slowly progressive towards cure. May heal spontaneously. Relapses may occur.</p>	<p>12. Yellow, tawny, sometimes bright, appears as if covered with a false membrane.</p> <p>13. No induration except from irritation and resulting inflammation. When present it is doughy and shades off into the surrounding tissues. The induration always disappears with the ulceration.</p> <p>14. Both auto- and hetro-inoculable.</p> <p>15. Often very painful and sensitive to pressure.</p> <p>16. May become phagedænic.</p> <p>17. Transmissible to animals, but with difficulty.</p> <p>18. Ulcers corrode, eating into the surrounding healthy tissue.</p> <p>19. Irregular. May cicatrize or extend rapidly. Relapses are common. Heals slowly.</p>	<p>12. Bright red.</p> <p>13. Inflammatory induration may occur.</p> <p>14. Sometimes when secreting thick pus is auto-inoculable, producing an ulceration, due to the presence of some pus germ.</p> <p>15. Its commencement is often preceded by stinging pain and may be accompanied by a burning sensation.</p> <p>16. Phagedæna uncommon.</p> <p>17. Sometimes when secreting thick pus is auto-inoculable.</p> <p>18. No invasion of surrounding tissues.</p> <p>19. Easily and quickly cured though recurrence is the rule. Usually remains about the size of the original vesicular ulcer and heals rapidly.</p>

DIFFERENTIAL DIAGNOSTIC POINTS OF CHANCER, CHANCROID AND HERPES PROGENITALIS.

(Concluded.)

CHANCER.	CHANCROID.	HERPES PROGENITALIS.
<p>20. Pathology: The chancre is composed of a new cell growth or infiltration of the normal tissue, accompanied by very little destruction of tissue. Scrapings often show the presence of epithelium.</p> <p>21. History: Do not occur on patients who have previously had syphilis.</p> <p>22. Bubo: The glands in immediate lymphatic circulation become indurated during the first or second week of the chancre.</p> <p>23. Number: A cluster or group of glands are involved.</p> <p>24. Frequency: Involvement of the glandular tissue always occurs.</p> <p>25. Suppuration: Rare.</p> <p>26. Time: Progress slow.</p> <p>27. Prognosis: Good for local lesion; general symptoms always follow.</p>	<p>20. Ulceration with destruction of tissue substance. Scrapings reveal granulation tissue.</p> <p>21. Occurs indifferently upon all whenever exposed to the virus.</p> <p>22. Usually not until after the third week.</p> <p>23. One gland only, as a rule.</p> <p>24. Two-thirds of the cases have glandular involvement; of this number about one-half are virulent.</p> <p>25. Virulent bubo following chancroid always suppurates.</p> <p>26. Progress rapid.</p> <p>27. Local lesions are often serious; tendency to spread; no constitutional symptoms follow.</p>	<p>20. Originally an elevation of the epidermis in spots by an effusion of serum.</p> <p>21. Occurs particularly upon patients with a long foreskin and sensitive balano-preputial surface, recurring when cleanliness is neglected or after a debauch or sexual excess.</p> <p>22. Occasionally it may induce an inflammatory adenitis.</p> <p>23. Generally only one lymphatic gland is involved.</p> <p>24. A very unusual complication.</p> <p>25. Suppuration may result.</p> <p>26. Progress rapid.</p> <p>27. No constitutional disturbance. Prognosis in all respects.</p>

Constitutional Syphilis.—The so-called secondary conditions appear in from twelve days to six months, sometimes as late as two years, but usually in about six weeks after the advent of the chancre. The manifestations are greatly

modified by treatment. Sometimes they fail to make an appearance, even when no anti-syphilitic remedies have been administered, the disease remaining dormant, and may reveal **itself** as a tertiary condition after many years of apparent health.

Secondary Prodromal Stage.—Constitutional syphilis is preceded by a secondary incubation during which period the general system is insidiously infected. During this stage, which often precedes the pathognomonic superficial cutaneous and mucous lesions, a varying degree of anæmia, chloro-anæmia, icterus, bone pains, general glandular involvement and fever develop.

The secondary prodromal stage includes the period from the first appearance of the chancre to the advent of the cutaneous lesions, during which the chancre and associated involvement of the lymphatics may be the only appreciable manifestations. Usually about two to four weeks before, sometimes coincident with or following the cutaneous outbreak, a chloro-anæmic syphilitic cachexia, characterized by mental depression, listlessness, indifference, dyspnœa, physical weakness, sallow skin, sunken eyes, periodic nocturnal neuralgic pains in different parts of the head, back and limbs, rapid, weak and small pulse, cardiac palpitation on the least exertion, slight rise of temperature, sometimes gastric and hepatic disorders, enlargement of the spleen and other visceral disturbances, etc., develop. There are also changes in the blood due to a diminution of the red and an increase in the number of the white blood corpuscles, actual count showing a reduction in the number of the red corpuscles of from one-seventh to one-half. Cachectic conditions may repeatedly occur during a syphilitic involvement of the system, especially in one possessing a strumous, gouty or broken-down constitution, but the later cachexia is generally mild in degree, and the characteristic blood changes do not occur.

Specific Lymphangitis and Lymphadenitis.—In about 20 per cent. of those having a genital chancre the lymphatics on the dorsum of the penis, extending from the specific sore to the glands in the inguinal region, become painlessly beaded and hardened, often giving, when examined by the touch, the sensation of a whipcord beneath the skin. If the chancre is not irritated, the skin covering the lymphatics and glands does not become discolored or adherent and there are no symptoms of acute local inflammation. Often the induration extends upward only two or three inches from the chancre. Sometimes as early as the fifth day after the appearance of the primary lesion, occasionally as late as two weeks, but generally between the seventh and ninth days, pathological changes in the glands in direct lymphatic communication take place. A number of these glands may become enlarged and indurated. They generally retain their oval forms with their long axes in the line of the groin. The gland nearest the chancre is usually the first involved, but sometimes there is a central large indurated gland with one or more smaller glands in the chain of lymphatics on one or both sides of the body. This combination is called a "pleiad." It is usually situated in the inguinal fold on the side corresponding to the genital chancre. Sometimes a number of glands are bound together in an indurated mass. Suppuration never occurs unless the glands become infected. The involved glands slowly return to their normal condition.

Towards the end of the prodromal period there is a general involvement of the superficial glandular system. This is essentially a hyperplastic growth within the lymphatic glands and is due to an involution produced by the syphilitic toxins. This change in the lymphatic system does not, however, reach its full development until the appearance of the syphilides, which is coincident with the general systemic contamination. Without question the tissue transition commences in the

early secondary period of incubation; in fact, it may be considered the earliest manifestation, and the subsequent changes in function depend primarily upon structural transmutation in the lymphatic vessels and glands. The microscope reveals in the invaded glandular structure, besides lymph corpuscles, large spheroidal cells, which contain several nuclei, the larger including nucleoli; these are more numerous in the cavernous than in the follicular portion of the glands. There is also a slight increase in the relative amount of connective tissue, with cell proliferation and sclerosis. The extent of the painless swelling of the lymphatic glands varies. The tumefaction may be so small as to be hardly distinguishable, or the glands may become from one-half to three-fourths of an inch in diameter. They are easily recognizable, retain their contour, are usually bi-lateral, may be soft or indurated and do not suppurate. The chain of lymphatic glands situated along the anterior and posterior borders of the sterno-cleido-mastoid muscle, the sub-occipital, posterior auricular and sub-maxillary, those located at either end of the clavicle and on the margin of the pectoral muscles and in the epitrochlear region are generally implicated. The deep lymphatic ganglia and vessels usually escape during the early secondary period but become involved during the tertiary. Specific lymphangitis is characterized by induration and persistency. Indurated or swollen lymphatic glands do not, however, necessarily indicate the absolute presence of a syphilitic contamination of the system, neither does their absence exclude it, but their disappearance positively indicates the decline of the disease. When a chancre has not been discovered and the clinical history suggests syphilis the situation of a lymphatic induration may approximately point to the location of the original or over-looked chancre. Fournier has presented the following table, which gives the anatomical location of the glandular lymphatic involvement to be expected from the situation of the original lesion:

FOURNIER'S TABLE, DIRECTING ATTENTION TO THE LOCATION OF THE CHANCRE FROM DISCOVERABLE LYMPHADENITIS.

SEAT OF CHANCRE.	GANGLIA INVOLVED.
Genital organs: Penis, scrotum, labia majora and minora, fourchette, meatus urinarius, entrance of the vagina, etc.,	Inguinal.
Peri-genital: Perineum, genito-crural folds, mons veneris, thighs, but- tocks, etc.,	Inguinal.
Anus and margin of anus,	Inguinal.
Lips and chin,	Sub-maxillary.
Tongue	Sub-hyoidian.
Eyelid,	Peri-auricular.
Finger,	Epitrochlear and axillary.
Arm,	Axillary.
Breast,	Axillary and sometimes sub-peritoneal.
Uterine neck,	Pelvic; exceptionally inguinal.

Syphilitic Fever.—In the majority of those afflicted with lues, a fever precedes or occurs during the advance of the constitutional stage. A careful study would probably demonstrate that it is always present. The fever is due to the action of the syphilitic germ or its toxins upon the sympathetic nervous system. The fever may pass unnoticed or the temperature may rise to 101° to 105° Fahr. It may be intermittent, remittent or continued in character. It may be preceded by simple shivering or a pronounced chill. The severity of the rigor before the advent of the erythematous syphilides frequently indicates the extent of the prospective cutaneous eruption. With the rise in temperature and increase in the pulse there are pains in the limbs and the back, malaise, thirst, etc., depending upon the idiosyncrasy and the varying excretory activity of the individual. The most common variety of syphilitic fever is the continuous, called by the Germans the "eruptive fever," it precedes the early syphilides by two to three or four days; possibly by only a few hours.

The evening temperature is usually about one degree above that of the morning ; it may rise sharply before the appearance of the erythematous rash. On the outbreak of the rash the temperature falls suddenly. The appearance of the constitutional manifestations may be accompanied by some increase of temperature. This is particularly true when there is a pronounced syphilitic cachexia.

In the latter part of the constitutional period, in conjunction with some special local constitutional manifestations, a distinct remittent type of fever may occur, the temperature varying from 102° to 105° Fahr.; it is never very protracted. The chill, which is incomplete, appears in the early evening and is accompanied by lassitude, soreness of the body, headache, etc. The stages are not well defined, the sweating being incomplete or absent. Relapses are quite common. The pulse rate is not proportionately increased. All syphilitic fevers with the exception of the typhoid variety are characterized by a clean tongue, good appetite and perfect digestion.

Sometimes, in the weakly, over-worked, under-fed or anæmic, who have suffered from exposure, indulged to excess in alcohol, in sexual debauchery, or have been subjected to improper treatment, a typhoid state develops, which Fournier calls "typhoid syphilitique." It is preceded for a few days by a sense of utter prostration, culminating in a mild dull frontal headache and small rapid pulse. The patient soon becomes pale and sallow, loses all energy, all the special senses become dulled, with confusion of the mind and at times a varying degree of delirium. The facial muscles lose their tone, but the face does not have the dull earthy expression of the typhoid. The appetite is lost ; the bowels are generally constipated, though diarrhoea may occur. Recovery may take place, though various nervous complications are prone to develop and terminate in death. The condition is distinguished from typhoid by the history, absence of abdominal tenderness, gurgling in the right iliac fossa on pressure, etc.

Syphilides.—The cutaneous manifestations which occur during the constitutional period are called syphilodermata or syphilides. They include a large variety of lesions of the skin, and possess certain general characteristics which greatly assist in their diagnosis. The absence of the subjective symptoms is peculiarly distinctive, itching, burning and pain being almost unknown excepting in eruptions of the scalp which sometimes itch, and those located upon the dependent portions of the body, as the legs, which are sometimes painful. A slight burning or itching may be present at the onset of the eruption or when urticaria happens to be associated with it. Where there has been a constitutional tendency to general prurigo or trichophytosis, the itching may continue and complicate the clinical history of the specific eruption. The early syphilides generally involve the whole body, while later the lesions arrange themselves in clusters, circles or parts of a large circle; the early skin manifestations are symmetrical in distribution, differing from the tertiary lesions of the skin which occur without reference to symmetry. The early lesions leave no prominent scars except when a precocious syphilide occurs. Some of the constitutional syphilides are followed by scars and pigmentation even if there has been no ulceration, but these generally soon disappear. Multiplicity of character, while present in other diseases of the skin, is very noticeable in syphilis, many varieties of the syphilides exhibiting themselves at the same time for consideration. On account of the rapid succession of the various forms of specific skin diseases, the name is given to the one that is most pronounced. Syphilides as a class seem more pronounced when viewed at a distance than when closely observed, the opposite being the case with skin lesions in general. The color varies greatly, being a combination of copper, red, brown, purple or black, approximating the tinge of raw ham, coffee or chocolate. The deep tints are due to pigmentation. The stain may re-

main for months or years after the disappearance of the original disorder. The cutaneous skin changes are somewhat chronic in character; they may subside after a certain time without

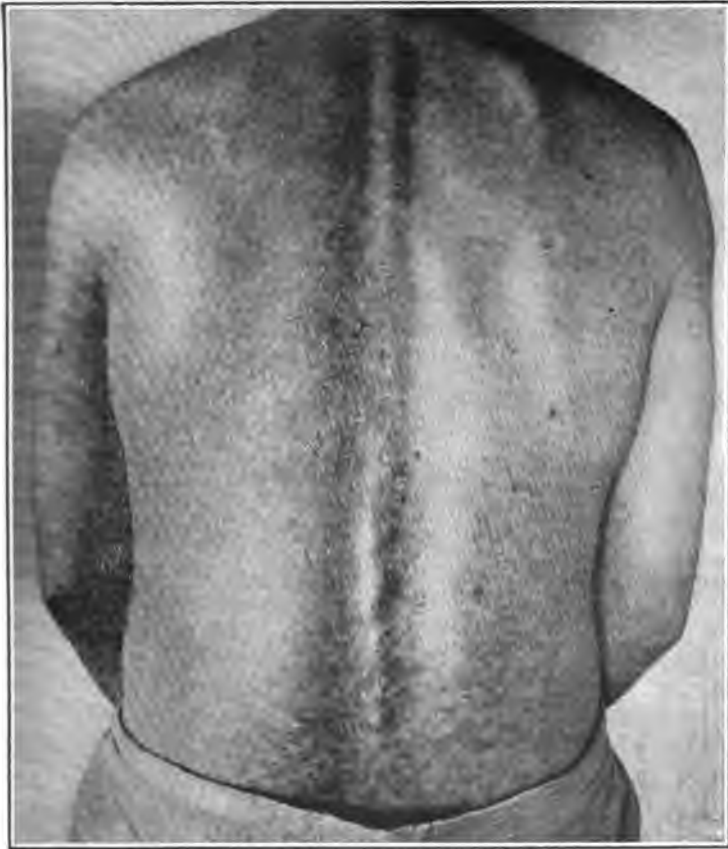


FIG. 154.—Erythematous Syphilide.

treatment, yet the duration is greatly limited by the proper medication. The scales of the syphilides are gray or dark-colored, not lustrous, are small in size and few in number. They frequently form a zone or fringe surrounding the base

of the papule; the crusts are green, black, yellowish or coffee-colored, forming layer upon layer, which are prominent.

Syphilitic Roseola or Erythematous Syphilides appear in from three weeks to three or four months, but usually about six weeks after the advent of the chancre. This eruption may develop unnoticed or rapidly during or after a hot bath, chilling of the surface, mental excitement or from excessive physical exertion. It may be preceded by a syphilitic fever or neuralgia. It may be months before it disappears; it usually exists from one to eight weeks. It may be perceptible for only a few hours, appearing first on the chest, abdomen and sides; it sometimes covers the whole body, but is more frequently confined to the parts protected by the clothing. When the skin of the whole body is involved it resembles measles (Fig. 154); at first the eruption presents a mottled or marbled appearance, requiring much careful diagnostic consideration. The fully developed eruption consists of numerous small, flat (not elevated), irregular, crescentic, circular or oval spots, with indented edges, from one-eighth of an inch to one inch in diameter, of a rose or salmon-red color. They may be confluent, and during the first few days disappear on pressure, but later they leave a dull red or brownish, tawny stain. They may scale a little. This skin disease is due to the action of the syphilitic toxins upon the sympathetic nervous system, producing a deviation of the nerve current, which induces dilatation of the peripheral cutaneous capillaries, with subsequent stasis of the blood current and exudation of leucocytes and red blood corpuscles into their respective integumentary areas, the varying degree of prominence of the roseola depending upon the degree of capillary dilatation and the number of red blood corpuscles extravasated.

Papular Syphilides.—The papular lesions follow the roseola in a few weeks or months; usually they appear in twelve to sixteen weeks after the advent of the chancre and

are visible from three weeks to two months. Relapses are frequent. Sometimes they are the first skin manifestations discovered. The papules may be located generally over the body (Fig. 155), or be confined to certain localities, *e. g.*, the



FIG. 155.—Papular Syphilide.

borders of the hair, the forehead (*corona veneris*), etc. They may be closely (Fig. 156) or sparingly distributed. All papules tend to exfoliate epithelial scales, particularly at their bases. This is due to the malnutrition caused by the pressure from the abnormal cell accumulation. This scaling at the base is

known as the "collarette of Biette," and when present is considered pathognomonic of syphilis. The papules may be pointed or flat, large or small.

The small pointed papules appear as firm acuminate elevations from one sixty-fourth to one-third of an inch in diameter; they are rose-red or purplish in color, and when irritated may develop a small vesicle or crust at the peak.



FIG. 156.—Papular Syphilide. (Dearborn.)

The large pointed papules are lenticular in form, and may appear upon the back, chest or shoulders; they are purplish-red in color; at the apex a pustule may form, which on breaking leaves a crust. They finally disappear, leaving no scar if not irritated.

The small flat papules (Fig. 156) are scattered generally over various parts of the body or are arranged in groups. They increase in diameter but not in height, are smooth, hard and of a rose-red pink, sometimes purplish color; at first they

vanish on pressure, but later a discoloration remains. They

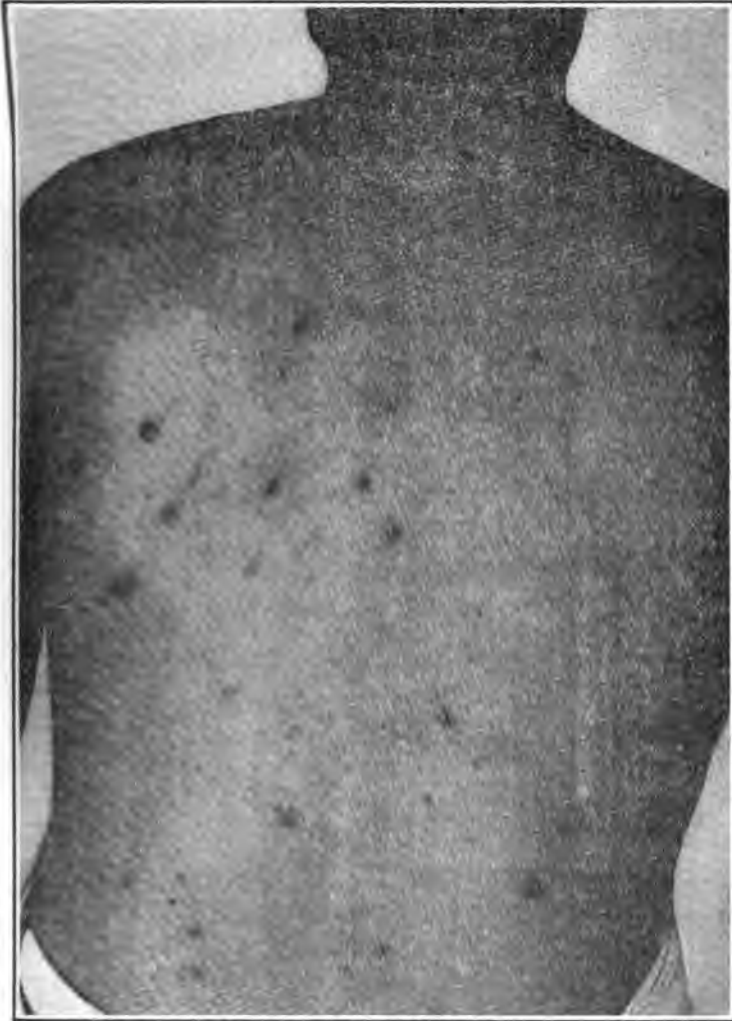


FIG. 157.—Large Flat Papular Syphilides.

may rupture or scale at the centre, the dried scales rolling

back, giving the characteristic appearance of a dirty lace collar or fringe surrounding the base of the papule. This form of syphilides finally disappears, leaving a tawny pigmentation which exists for some time, but finally fades away without leaving a scar, unless from irritation ulceration occurs. Relapses are frequent.



FIG. 158.—Palmar Papular and Papulo-Squamous Syphilides.

The large flat variety (Fig. 157) are usually located upon the face, forehead, neck, back or thighs; each papule is covered by a thin, yellow superficial scale like a crust, which has a raised border and depressed centre, the edge being distended by a little serum and surrounded by a red areola; the crust becomes detached, the papule gradually subsides and the areola of pigmentation disappears without leaving a scar.

The serum of these papules is very liable to spread infection unless they receive proper attention. When the large flat papules occur on the scalp they produce a scaly condition and are accompanied with enlargement of the post-cervical glands.

Papules also develop on the palms of the hands, especially in laborers. The hands are frequently symmetrically affected; on account of the texture of the palms the papules are often not fully developed. Their presence is presumptive evidence of syphilis. They look much like lichen-urticatus, but are distinguished from this by the absence of itching. The epithelium covering the palmar papular syphilide becomes yellow, dry, cracked and falls out, leaving a tunnelled out, circular, flat, slightly depressed, red spot, while at the edge it is apparently over-lapped by white fringy scales and may be surrounded by a slight areola (Fig. 158). Sometimes they become fissured. They often heal without spreading. Similar lesions (Fig. 159) may appear on the soles of the feet.

The syphilitic papule is caused by a circumscribed infiltration into the superficial layers of the skin of a general round cell material, furnished by the blood; in other words, a dense localized infiltration into the papillæ and corium, the germinal cell accumulation aggregating in regular layers around the vessels and in the meshes of the adjacent connective tissue. These cells do not tend to organize, but they undergo granular and fatty degeneration, the resulting detritus being removed by the absorbents of the parts and eliminated by the various emunctories of the system. If, however, the cell accumulation is large and it in any way comes in contact with pus-producing germs a pustular form of syphilide develops. The papule is composed of two layers of cells, one in the corium and the other in the papillary layer of the skin. They are, however, closely cemented to each other and the epidermis is tightly drawn over them. The degree of density and dryness of a papule depends upon the amount of cellular infiltration, and

its color upon the capillary stasis and the amount of blood coloring matter transfused into the lesion. Syphilitic papules are undoubtedly of neurotic origin. The specific ptomaines first poison the sympathetic ganglia and nervous system, with



FIG. 159.—Plantar Papular and Papulo-Squamous Syphilides.

resulting disarrangement of the tension of the peripheral venous and arterial capillaries and lymphatics. The disturbance of the trophic functions induces an increased amount of the nutritive pabulum to be delivered to the parts by the

arteries, which the venous capillaries and lymphatics are unable to remove, together with the usual products of retrograde metamorphosis, hence perverted nutrition and excessive tissue building in various parts of the cutis and papillæ follow. In health the lymphatics are capable of removing all surplus germinal matter and returning it to the general circulation for elimination, but in the syphilitic process the increased cell proliferation is so rapid that the lymphatic vessels which are choked, thickened, and their calibre occluded by external pressure, are inadequate to the task, hence abnormal localized cell growth. In time the action of the lymphatic vessels is completely inhibited and is only restored when necrobiosis of

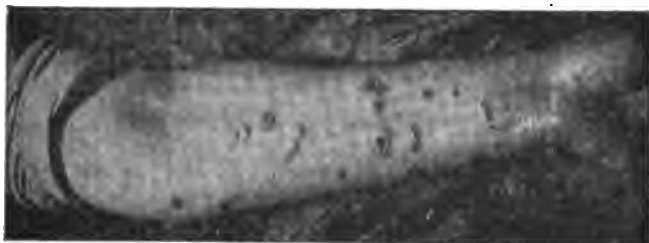


FIG. 160.—Large Pustular Syphilides. (Stelwagon.)

the new-formed tissue takes place. The accident of location, moisture and heat sometimes transforms the papule into a vegetation.

Pustular Syphilides, are not as frequent as the papular form. They are often associated with them. They vary from one sixty-fourth to half an inch in diameter, may be early or late in their appearance, persistent or transitory, arranged in groups or isolated and scattered over the body. They have three natural divisions: General superficial pustules, complicating erythema and papular syphilides, a pustular acne and a superficial ecthyma.

General Superficial Pustules may be abundantly scattered over the body in conjunction with the erythematous and papular syphilides. They may appear alone on the forehead, upper lip or sides of the nose, fingers, palms of the hands or lower extremities, commencing as erythematous spots, which, as pus is formed, soon become yellowish at the apex. This lesion becomes fully developed in from one to three weeks. The pustules vary much in size (Fig. 160), are superficial and sometimes run together; their base is not hardened; they are surrounded by a dull yellowish, brown or red collar; they dessicate rapidly, leaving a dark crust; the pustule healing beneath it leaves a livid thickening at its site which may continue for some months, or ulceration may occur from which vegetations often spring. The site of the pustule may be marked by a thin, white, round scar, somewhat depressed in the centre, which in time finally disappears.

Syphilitic Acne.—These livid papules appear scattered over the body, especially on the face and lower extremities. From the apex of each involved sebaceous gland projects a hair. They do not appear before the sixth month; they reach full maturity in from one to three weeks. When they appear earlier and are accompanied by iritis it indicates a severe form of syphilis. Relapses are common and successive crops may keep this variety of skin disease in evidence for many months. The duration of this syphilide is about eight weeks. Its base is red and is surrounded by a ring of pigment. As the pustule develops the apex becomes yellowish-green and finally breaks and forms a scab, which may drop off in small flakes as the ulcer heals, or it may remain ulcerated for some time. As resolution takes place a depressed scar, somewhat deeply pigmented, slow in disappearing, will mark the location of the lesion.

Superficial Ecthyma.—When this syphilide develops early in the second stage it indicates a grave if not malignant form of syphilis; it usually occurs late in the secondary period and

might be considered tertiary in character. It may be located upon any part of the body, beginning as a reddened papule with little or no pain, from which a broad pustule, from one-fourth to one inch in diameter, with a dark-red and infiltrated base, is soon formed. It may become umbilicated. The pustule dries into a thick, greenish or black scab, and ulceration may continue beneath it; when the crust is removed a quantity of thick and often bloody pus will be exposed. As the ecthyma develops it becomes surrounded with a dark-red or copper-colored areola, and on healing leaves a dark copper or purple-colored cicatrix, somewhat depressed and thickened, which in time gradually whitens from the centre towards the circumference.

Pigmentary Syphilides sometimes appear in patches varying from one to two inches in diameter, on the side of the neck, face and chest. They often coalesce, the skin between the patches of pigmentation appearing whiter than normal.

Vesicular Syphilides may appear late in the secondary stage, but are of infrequent occurrence. They are usually located upon the trunk or extremities and are arranged in circles or segments of circles. Their bases present a livid appearance, which shades off into a bronzed areola. They vary in size, are usually small and pointed, and, if large, may be umbilicated; they may dessicate or become pustular and in maturing leave livid spots which remain for some time and may whiten and finally disappear.

Bulbous Syphilides.—This luetic skin disease may appear late in the secondary stage of acquired syphilis. It is more common in the hereditary syphilis of infants. The lesions vary from one-half to two inches in diameter, appearing isolated or scattered over the body.

Tubercular Syphilides are always a late secondary manifestation, rarely occurring before a full year after the chancre. They may arrange themselves in circular groups or be gen-

erally distributed over the body. They appear even years after all trace of the disease has disappeared.

General Tubercular Syphilides.—This condition is quite rare. Tubercles may appear scattered over various parts of the body, especially on the face and forehead. They vary from a quarter to three-quarters of an inch in diameter, are round or oval in contour, somewhat elevated, and of a red or copper-color. They develop in the true skin beneath the papillary layer, though they are not a gummatous involvement of the subcutaneous tissue. After a short time they become covered with a scaly top that gradually falls off; the tubercle is gradually absorbed, leaving a slightly brownish stain.

Circinate Tubercular Syphilides.—These are so named from the conformation of the lesion. These tubercles are smaller in size than the general tubercles and are always arranged in circles or segments of circles enclosing healthy integument. The various tubercles may vary from one-eighth to one-half inch in diameter. The patch is frequently located on the face or forehead and may last for years; on healing it leaves a white, smooth scar or a slight discoloration of the skin. Often a group of tubercles becomes confluent and presents a livid, uneven and scaly elevation of the skin. Sometimes new tubercles develop and form an areola around the scaly patch (Fig. 161), producing a so-called tuberculo-squamous syphilide. This is practically a tertiary lesion, though it may occur during the late constitutional period.

Squamous Syphilides.—All of the syphilides have a tendency to scale at some period of their existence. This may be so marked that it is impossible to state for which lesion the disease should be named. True squamous syphilides rarely appear before the end of the sixth month; if earlier, they are generally an accompaniment of a papular or erythematous eruption. They are practically a late manifestation of the

second stage. They may appear even after tertiary conditions



FIG. 161.—Tubercular Squamous Syphilide.

have appeared and been long cured. They vary from one-third to one inch in diameter and have a circular form;

their bases are slightly elevated, bluish, livid or red in color, covered with a thin coating of scales which are small, do not overlap one another and are firmly adherent; when desquamation occurs they will be followed by other but smaller scales. Squamous syphilides may be located on all parts of the body, more especially on the trunk (Fig. 162), extremities and face; on healing they leave no scars but may last for weeks or months. The circinate variety may appear on the scrotum and genitals, often simulating ringworm.

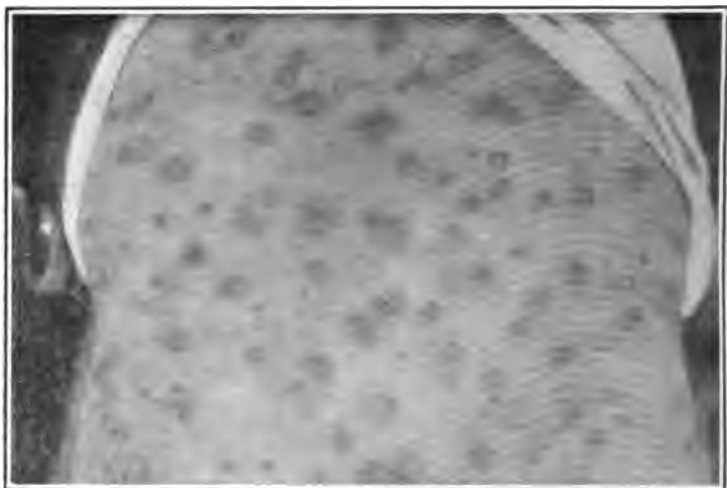


FIG. 162.—Late Papular and Papulo-Squamous Syphilide. (Dearborn.)

The circle, however, does not increase in size as in ringworm, though a number of circles may run into each other. The diseased border is generally about one-eighth of an inch in width, often somewhat papulated, the inclosed skin being perfectly healthy. When squamous lesions are located on the palmar or plantar surfaces, they may cover large areas and often persist for some time; their bases are livid; they are round in contour, sometimes fissured, surrounded by a red collar and covered with gray scales.

Syphilis of the Mucous Membranes.—The mucous membranes of the body rarely escape local implication during the constitutional period of syphilis, the most pronounced lesions being located in the mouth and throat, induced or encouraged probably by irritation from hot or over-seasoned food, bad teeth, pipe stems, tobacco, etc. They also appear about the anus. They may occur at any time during the secondary stage and are sometimes observed during the tertiary period.

Erythema of the Throat.—Three to eight weeks after the appearance of the chancre, an erythema, diffuse or circumscribed, of a dull red color, may appear on the mucous membrane of the mouth or throat, generally upon the fauces. It may precede, accompany or follow the erythema on the skin. It may extend and involve the pharynx, the nasal mucous membrane, Eustachian tube or spread down the larynx or forward to the buccal cavity. Its symptoms resemble those of a cold, with aphonia and other evidences of irritation. It is usually transitory in character and often escapes recognition. In those who continue to use tobacco and are careless about attention to their teeth and mouth, ulceration may ensue. It occurs more frequently in men than in women. Recurrence is frequent. This involvement of the mucous surfaces is undoubtedly akin to the roseola of the skin and is also due to the action of the toxins in the blood upon the vaso-motor system.

Mucous Patches.—These papules on the mucous membrane appear in perfection at a period which corresponds to the time of development of the papular syphilides. They are characteristic and there are few syphilitics who escape them. With the mucous patches there occurs a trophic disturbance similar in all respects to the neoplastic growths and ulcerations already described as occurring on the skin. They are most frequently observed in the mouth, on the soft palate,

pharynx, tongue, and in the neighborhood of the anus, they may appear during the early or late stages of syphilis. When moisture is present they may occur upon the skin. These patches are rounded, oval or irregular in contour, usually somewhat elevated. The plaques are of a milky or ashen color, covered with a grayish exudate and unless irritated are



FIG. 163.—Mucous Patches of the Anus.

painless. On the tonsils they may give rise to vegetations and ulcerations. The associated ulcerations are round, oval and sometimes irregular in form; at first they are covered with a grayish-white pedicle, which on removal leaves a smooth raw surface, when irritated the ulcers may become indurated around the edges and become quite painful.

When the irritation has been sufficient to cause much induration the ulcerations appear deep, with sharp cut borders; the bases are unhealthy, tawny yellow in color and exude a purulent fluid. The irritated ulcerations are located most frequently at the corners of the mouth, on the tongue, tonsils, and at the anus. Lesions of the mouth and throat are attended by some swelling of the sub-maxillary glands,

sometimes with a slight swelling and soreness of the tonsils, the ulcerations usually lasting two or three weeks.

Plaques Muqueuse on the skin grow rapidly, frequently granulate and proliferate, producing broad papules or excrescences discharging a foul-smelling fluid. They may

be covered with a quasi diphtheritic deposit. They occur about the anus (Fig. 163), about the genitalia (Fig. 164), between the toes, and are known as mucous tubercles or condylomata. When mucous patches appear around the mouth they are dry and of a dull red color. In conjunction with onychia and paronychia, they eat under the



FIG. 164.—Condylomata of the Scrotum and Anus.

nails like a soft corn. Another variety of mucous patches, which commences as macules about the size of millet seeds and spreads over the surface, or as flat circular papules of various sizes scattered over the upper surface and sides, accompanied by superficial infiltration, appears on the tongue. It is sometimes known as the toad-back tongue.

An erythematous rash or mucous patch may develop in the urethra of the syphilitic and cause a urethral discharge simulating that of a mild urethritis. These lesions often appear in the vagina. A mucous patch may, about the female genitals, become transformed into a condylomata and exude an offensive discharge. Secretions from all mucous patches are contagious. Patients who have these lesions must be repeatedly warned against kissing and special care must be given to the cleansing of utensils used in common by themselves and others.

Plaques Opalines occur on the dorsum or sides of the tongue, buccal mucous membranes or pharynx. They are often induced by irritation from tobacco, etc. They are rounded or irregular in form, flat, smooth, white or bluish-white in color, appearing as if recently touched with Nitrate of silver. This frosty surface is not easily removed; the more severe the lesion the whiter will be the scales; it may crack, bleed and become painful, though pain is usually absent. A similar condition may be caused in the non-syphilitic by tobacco, etc.

Brain and Nerve Affections in Secondary Syphilis.—There are many symptomatic or clinical manifestations which may occur during the secondary incubation period and in the true constitutional stage, which require more than a mere mention. Cephalalgia and some other minor cerebro-spinal and mental conditions have been observed. Sufficient attention has not been given to these very important conditions which, if unrelieved by proper treatment and suitable hygiene and habits, often result in irreparable damage to the delicate nerve mass, which will remain after the specific lesion has been removed. These manifestations may be due to the poisonous action of the toxins upon the cerebro-spinal mass, the sympathetic nerves, etc., as well as to the new growths around and within their structure, causing cephalalgia, neuralgia, convulsions, etc.

Neuralgia.—Pains of luetic origin occurring in various parts of the body are characterized by their aggravation during or by being present only at night. The pain may follow the course of the cranial, the fifth intercostal, the sciatic nerve or its branches. Intercostal and abdominal neuralgias often exist. They generally appear suddenly after some mental, physical, sexual or alcoholic excess. The posterior spinal nerve roots are especially liable to attack by the syphilitic morbid principle. When this occurs there is loss of sensation with accompanying excruciating pain. Syphilitic neuralgia is prone to appear in those who have formerly from any cause suffered with neuralgia.

Cephalalgia.—The pain may be general or confined to the parietal, temporal or occipital region. It may be continuous or transitory and is always aggravated at night. Nocturnal headache in a varying degree of severity is rarely wanting; sometimes it is of a throbbing or boring character; there may be a sensation as if a nail were being driven into the head or of its being crushed in a vise. Some describe the cephalalgia of lues as being of the most agonizing character, making the approach of night much to be dreaded. When the pain is localized the affected region is sometimes sensitive to the touch. If not relieved by treatment, the special senses become affected, with loss of sleep, vertigo, impaired memory, apathy, melancholia, and finally the patient becomes bed-ridden and apparently afflicted with a hopeless cerebral lesion.

Hysteria and Analgesia.—These sometimes occur, particularly in women. The sense of touch and the appreciation of temperature may be modified or lost over the whole surface of the body, or certain locations, *e. g.*, the lower half of the forearm, back of the hand, the feet and ankles, and in the female particularly the region over the breasts. The condition continues for months.

Deafness is a symptom; there are a few recorded cases.

Insomnia and even temporary mental aberrations are sometimes observed which do not cease until anti-syphilitic treatment is instituted.

Mental Aberration.—When this condition is of syphilitic origin it is characterized by marked violence, tendency to suicide, fear of assassination, attacks from animals, etc. Fever sometimes follows or develops during the period of secondary incubation and the early constitutional epoch. Appropriate treatment has generally produced a return to reason and health. It is, in all forms of mental aberration, always well to look for evidence of the present or past existence of syphilis and to give the patient the benefit of the doubt if discovered.

Aphasia, which is a common manifestation in syphilis, may be transitory or continuous; it has no special symptom to distinguish it, except the general history. The prognosis is fortunately good. When the victim speaks two languages, he may be unable to converse in one, but can speak the other, or when unable to speak he is usually able to write his wishes and desires.

Facial Paralysis may occur in early or late syphilis, and is sometimes preceded by formication, numbness, etc., in the affected region. In late syphilis it may indicate the approach of hemiplegia.

Chorea.—Choreiform movements may be present either before or after a paralytic seizure, and may be of long or short duration.

Epilepsy is usually preceded by headache, etc. The seizure may be heralded by prodromal symptoms. In the *grand mal* of specific epilepsy the shrill cry of true epilepsy is absent; unconsciousness is never complete; there may be frothing at the mouth. The seizures occur at intervals of hours, days or weeks, and lead in time to dementia. Syphilitic epilepsy occurs usually in adults who have not had epileptic fits before

their twenty-fifth year. In specific epilepsy the seizure usually lasts half an hour or more; true epilepsy usually commences in childhood, and the convulsive seizure rarely lasts over five minutes. The convulsion commences unilaterally in a finger or toe, thence extending over the body. The *petit mal* is a mild form in which only one set of muscles is involved, with perhaps momentary loss of memory, confusion of thought and incoherent speech.

Hemiplegia of a syphilitic origin is characterized by its incompleteness. The attacks are of moderate degree and usually occur without loss of consciousness, often accompanied by some aphonia, which comes and goes at short intervals. It is frequently preceded by localized cephalalgia and tenderness over the affected cerebral region, neuralgic pains, numbness of the affected parts and lassitude. The hemiplegia may occur during the night or day; motor-function is not usually entirely lost, one arm or one leg may be involved, or only a certain group of muscles, or the arm and leg of one side and the facial muscles of the other. Hemiplegia occurring before the fiftieth year is more than probable of specific origin.

The hemiplegia of syphilis is frequently accompanied by paralysis of one or more of the motor-oculi nerves, a condition which is pathognomonic of syphilis. Motor-oculi paralysis may be the only evidence of intra-cranial disease; the reason of the frequency of this condition in lues is due to these nerves lying in contact with the meninges and the floor of the skull for a long distance before entering the orbit, at which location specific deposits are of frequent occurrence. If a hemiplegia is of syphilitic origin, the prognosis is good compared to a similar condition resulting from other causes.

Paraplegia, due to a luetic invasion occurs, without loss of consciousness; it may have been preceded by other specific nervous conditions and may be partial, complete, sudden or

slow in development. Of all paraplegias occurring before the age of forty 50 per cent. are of specific origin. It frequently happens without sensory disturbance; one side of the body alone may be involved; the paralyzed muscles are subject to convulsive seizures and to localized hyperæsthesia and anæsthesia.

Coma resulting from syphilitic lesions may be preceded by cephalalgia, anæsthesia, hyperæsthesia, paraplegia, hemiplegia, loss of memory, etc. It may occur suddenly during the night, the patient being discovered the following morning apparently asleep. He can be aroused to take food and drink; he is listless, yet able to answer questions and recognize friends; the pulse and respiration are slow, the pupils contracted, the eyeballs sunken, the eyes directed outward, with dry tongue, involuntary stools, and sub-normal temperature. These symptoms, together with the age of the patient, are often of great diagnostic importance.

Rheumatic Pains involving the muscles, fascia, bones and joints of syphilitic origin are common; the large joints and muscles are chiefly affected, the pain varying from a simple weak feeling to a severe dull aching which becomes almost unbearable at night, and often almost entirely disappears during the day. Acute syphilitic articular rheumatism may occur during the early months of an attack of lues. The large joints are most frequently affected, becoming painful, swollen, sensitive and red. The inflammation often continues for two or three months. The temperature varies from 99° to 105° Fahr. There may be mild sweating, but not the intense sour perspiration characteristic of acute articular rheumatism. Synovitis in the early stage is characterized by a slight stiffness of the joint at night or in the morning which passes off during the day, with a slow and painless effusion into the synovial sac, possibly accompanied with a slight dull pain at night. The integument covering the joint does not present

any evidence of inflammatory action. The variation in the amount of effusion from day to day in the early period is very

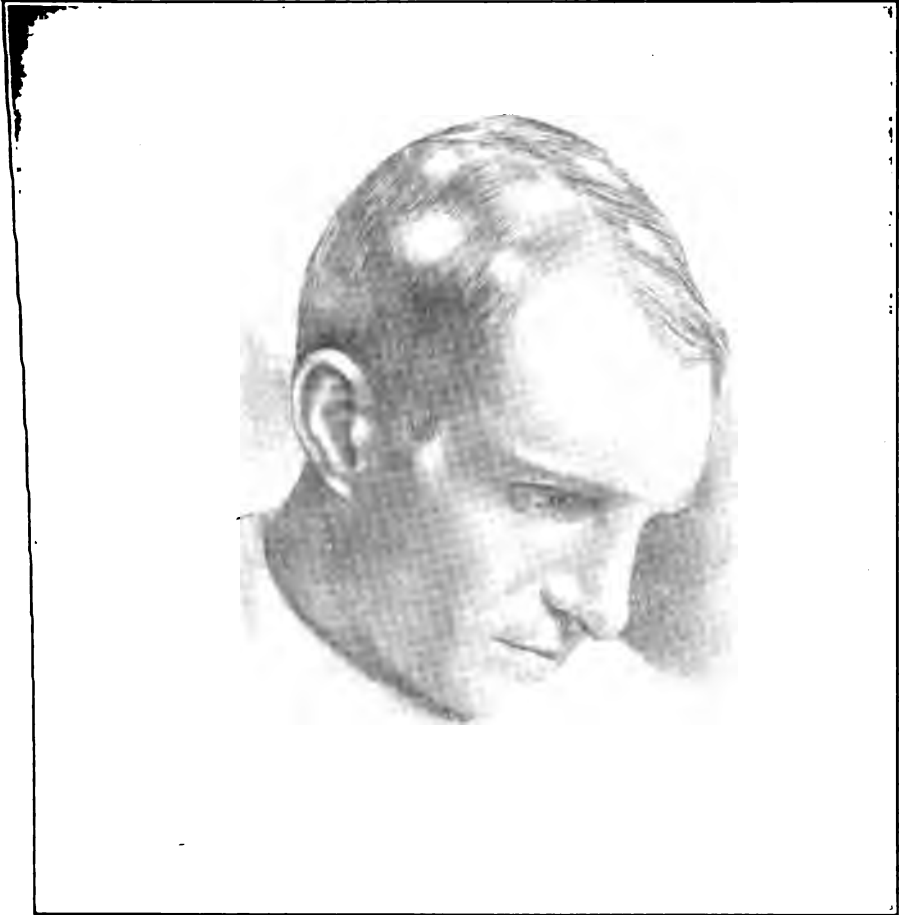


FIG. 165.—Syphilitic Alopecia.

characteristic; later it may remain stationary. The condition generally responds readily to anti-syphilitic treatment, though it may assume a very chronic course.

Alopecia.—Loss of hair is one of the frequent and dreaded revelations of syphilis. It may occur as an early or late manifestation. There is generally some falling of the hair from the head, the eyebrows, mustache, beard, over the pubes and in the axilla; in fact, there may be a complete shedding of the hair, with the exception of the eyelashes, which usually escape. The hair may be slowly or rapidly lost. Rather suddenly, at each combing, large quantities of hair may come out with resulting general thinning or entire loss, or irregular bald patches of unsymmetrical rounded outline (Fig. 165), may suddenly appear being most pronounced on the back and upper portions of the head, which gives the scalp a moth-eaten appearance. There are no subjective symptoms, though during what may be designated as the papular period, a few papules and crusts may be sparingly scattered through the hairy parts. The loss of hair occurring during the constitutional period is rarely permanent, while the alopecia due to ulcerative destruction of the tissues of the scalp and consequent obliteration of the involved hair follicles, which may happen during late syphilis, is rarely if ever reproduced. Alopecia transpiring during the early months of the constitutional period is due to nutritive disturbances. The scalp becomes dry and scaly, the hair follicles prominent, with stumpy hairs protruding from them, or there may be here and there a few long hairs or tufts of hair. Davier says that in syphilitic alopecia the majority of the shafts and bulbs of the hairs seem normal, but there is less pigment, and the medullary portion may be absent. The diameter of the hair at the bulb becomes reduced to the extent of one-quarter to one-half the normal size, and the shaft is uniformly thin except at the bulb.

Gionannini found a small-celled infiltration in the connective tissue cells of the periphery of the lower two-thirds of the follicles particularly around the vessels. As a result, he says,

the nutrition is impaired and the hair falls. Other observers are of the opinion that the new-celled infiltration is insufficient to deprive the hair follicle of nutrition, and that the most reasonable cause is a trophic neurotic change due to disturbance of the sympathetic nervous system caused by the presence of the specific toxine.

Onychia and Paronychia.—The lesions of the nails and adjacent parts vary somewhat in the different epochs of the disease. They may be mild or severe in form, of long or short duration. The two conditions are usually so intimately associated that they are best described together. Some divide the disease into two classes, calling it onychia when it begins in the nail and extends to the surrounding parts, and paronychia when it commences in the tissue around the nail. In the early constitutional period the nails lose their lustre, become thinned, brittle and liable to crack, and the white spots increase in number. In the latter part of the secondary and in the tertiary stage the matrix may be profoundly involved; the nail loses its lustre, becomes grayish-yellow in color, dry, irregularly corrugated and thinned, brittle and cracks easily; possibly here and there round excavations where the nail tissue has softened; disintegrated and been removed by the general washing and friction of the hands will be found. The nails may become thickened, brittle, crumbly, separated from their attachments and the edges everted, the skin and other tissues in apposition to them at the side, or base of the nail or both may be swollen, œdematous, of a purplish-red color and may contain pus. They may be fissured and scaly. Sometimes the nail increases greatly in size, becoming three or four times its normal thickness; it may be tilted upon one side and beneath it there may exist a granulated, indolent surface which exudes a grumous putrid fluid. Mucous patches frequently undermine the nail, involve the matrix and may separate it partly

or completely from the underlying tissue. The nail may be thrown off, ceasing to grow at the matrix while the tip grows forward, the posterior margin presenting a free ragged edge, exfoliation occurring without any appreciable lesion, a new nail taking its place. The infiltrated skin around the nail and ends of the fingers may continue scaly for some time, but eventually, even in the most severe cases of onychia, the digital extremities return nearly to their normal condition.

Osseous Tissues.—The bony tissues, especially when near the surface, become sore, painful and nodules appear (acute periostitis). Acute synovitis and tendo-synovitis may also develop.

Visceral Involvement.—The thoracic and abdominal organs often give evidences of syphilitic invasion. During the early secondary period, there may be congestion or hyperæmia; in the later stage of the constitutional involvement infiltration of the respective organs may occur, which may perhaps cause a pleurisy with the usual physical symptoms, a hepatitis with soreness over the lower region or a hyperæmia of the renal tissue and consequent albuminuria.

TERTIARY OR SEQUELA PERIOD.

Sequela or Tertiary Syphilis.—The tertiary manifestations of lues rarely occur before the end of the second year. They have been known to appear as late as fifty-five years after the chancre, the health of the individual during the interval remaining seemingly perfect. Sometimes in what is known as malignant or precocious syphilis—owing to some constitutional or nervous idiosyncrasy—they appear within the first few months. Tertiary syphilis is characterized by an infiltration into the involved tissues (gummy infiltration) and a resulting new growth (gumma), which increases at the expense of the implicated tissues. Absorption of this

new material, without apparent loss or continuity, may take place; more often by degeneration it terminates in ulceration and the formation of an open sore, or the gumma may, owing to lack of vitality, want of organizing power and deficiency of blood supply, break down into a purulent mass, which, in time, undergoes fatty or granular degeneration and may ultimately be absorbed without involving the integument or other tissues covering it. After the removal of a gumma by the process of fatty degeneration, owing to Nature's inability to restore the lymphatic structures to a perfectly normal condition, there is always a tendency to recurrence. Gummy infiltration may occur in any part of the body; it invades particularly the cellular tissues, the skin, bone, liver, testes, brain, kidneys and lungs, as named in frequency.

The syphilitic gumma is a non-encapsulated, red, grayish homogeneous cellular mass, which varies somewhat in consistency. It may be diffused throughout the involved tissue or be confined to a circumscribed area. It is composed of nucleated cells which, in microscopic appearance, do not differ from white blood corpuscles or leucocytes; the nuclei are not characteristic. Gummatous material, if brought into contact with a wound in the healthy skin or mucous membrane of one virgin to lues, is not capable of producing the train of symptoms called syphilis. In this way only do the late infiltrations of the tissues of the body which occur in constitutional syphilis differ from the sequela-tertiary manifestations. Gummatous growths are undoubtedly the result of lesions in the lymphatic absorbents, which prevent the proper performance of their functions, *e. g.*, removal of the surplus material; this allows the excessive supply of embryonic cells to accumulate, resulting in a new growth, which in turn presses upon the blood-vessels of the part, thus impairing its nutrition and terminating in various degenerative

changes. The different phenomena which may appear during this stage of syphilis will depend upon the extent and degree of the lesions produced in the lymphatics and blood-vessels, their duration, the treatment observed during the constitutional period, and the vulnerability of the subject plus the constitutional and individual idiosyncrasy. Occasionally when the luetic condition has given little or no trouble during the constitutional period, it may, without apparent cause, terminate in grave tertiary conditions, with extensive destruction of the naso-palantine or maxillary bones, as well as destructive ulceration of the throat and pharynx, etc. When gummatous conditions involve the skin or mucous membrane, they usually break down, forming deep ulcerations, which tend to erode and destroy the surrounding tissues; these ulcers do not close readily, and when cicatrization occurs deep scars and much loss of tissue often result. These lesions are usually accompanied by emaciation, loss of appetite and strength, mental depression, dry, tawny skin, dryness of the hair, sleeplessness, small rapid pulse, general anæmia, etc.

The tropho-neurotic element, as the immediate cause of tertiary syphilis, is of the utmost importance and is worthy of more than a passing consideration, the sympathetic nervous system being particularly implicated, especially the cervical portion. The parts supplied by the fifth cranial nerve are particularly prone to involvement in tertiary syphilis though the nerve trunk is rarely implicated.

Tertiary as well as secondary manifestations appear frequently in the various structures of the head, mouth and throat. In untreated syphilis there is always a tendency to involvement of the important organs of the body, with final destruction of their special tissues. In tertiary syphilis the trophic succeed the vaso-motor disturbances of the earlier stages, and destruction of tissues by necrosis or ulceration follows. The tropho-neurotic conditions in the early constitutional stage are

due to the toxic effect of the syphilitic infection—be it a morbid matter or toxine—upon the sympathetic nervous system ; in the constitutional period it is due to direct pressure upon the nerve structure or its coverings by the infiltrated tissue, and in the tertiary period, to disturbances due to deranged nutrition and absorption the result of pernicious and neglected infiltrations and overgrowths which have produced changes in the walls of the vascular and lymphatic vessels during the secondary period.

The special tertiary phenomena occurring upon the skin and mucous membrane deserve consideration.

Ecthyma.—This syphilitic lesion may appear on any part



of the body, but more frequently on the lower extremities ; recovery is slow and successive invasions are liable to occur. It consists of an infiltration of the true skin, with a gummatous material producing a painless hard lump in the integument surrounded by a red areola ; after a few days a pustule appears on the solid elevation, breaking or drying into a dark brown or greenish crust which overlaps the original sore, while beneath it the gummatous deposit disintegrates, forming an ulcer with sharp, abrupt edges pultaceous floor and surrounded, by a red areola of inflammation (Fig. 166). On healing it leaves a depressed and deeply pigmented scar, which, in time, fades from the centre towards the circumference, leaving a pearly-white, lustrous scar.

FIG. 166.—Syphilitic Ecthyma.



FIG. 167.—Syphilitic Rupia and Onychia.

Rupia.—This disorder occurs only when the system is profoundly affected by the syphilitic poison. These lesions varying from one-third to an inch in diameter may be isolated (Fig. 167) or appear in groups on any part of the body. They commence as pustules or bullæ which dry or rupture, forming crusts which rest on indurated bases beneath which are ulcerating surfaces discharging much pus. After a time the individual ulcers, by eating at the circumference, undermine the original scab which is raised from its attachments by the constantly accumulating pus; this also dries into a greenish-black crust; around the elevated scabs is formed an epidermic raised ring filled with sero-pus. This process is continued until layer after layer is formed, sometimes attaining an inch in thickness and resulting in a corrugated scab of a blackish or greenish-brown color resembling in contour the outer surface of an oyster shell. If pressure is applied over it a purulent fluid will ooze out at the edges. The ulcerating surface may finally heal underneath or the crust may fall off, leaving a deep ulcer with abrupt edges and pultaceous base. When healed deeply pigmented scars (Fig. 168) remain, which finally become pearly-white from the centres to the circumferences.

Pustules commence as small red spots soon becoming blisters which in a short time rupture or coalesce forming a thick greenish scab covering the whole of the affected surface and surrounded by a purplish-red areola. Beneath this crust ulceration goes on, extending beyond the circumference; the crust may fall off leaving a deep, ragged ulcerating surface that tends to extend superficially by serpiginous ulceration. On healing it leaves a livid or deep-brown scar which in time whitens from the centre towards the circumference.

Ulcerations of the Cutaneous Tissues.—In tertiary syphilis they may be superficial or deep, the result of the breaking down and disintegration of the rapid cell-growth within the tissue

from any gummy infiltration. They may be the sequence of a pustular syphilide. They may be the sequence of a pustular syphilide. They may be classed as superficial and deep; the superficial usually originate as ecthyma, rupia or pustule, gradually eating into the tissues beneath the crust which covers them. They may commence as a glistening red tubercle, one-quarter to three-quarters of an inch in diameter, which after a time break down and ulcerate. The ulcera-



FIG. 168.—Scars from Tertiary Skin Lesions.

tions have abrupt adherent edges, livid pultaceous bases, discharge a grumous pus and are usually covered with greenish-brown scabs. They are surrounded by an indurated copper-colored areola and may be stationary or serpiginous in character. They ulcerate at the circumference in curved lines, and on healing leave irregular, deeply pigmented scars, which in time become white and glistening.

The deep variety of ulcerations appear especially on the head

of the penis, the nose, ears and lips, commencing as small tubercles which rapidly disintegrate ; the ulceration eat deeply into the tissues beneath (Fig. 169), destroying everything, skin, connective tissue, muscle, cartilage and bone, in their course. They are usually covered with thick greenish-brown scabs. The ulcerations are sometimes intermittent in activity and leave on healing deeply pigmented scars (Fig. 169),



FIG. 169.—Deep Syphilitic Ulceration and Resulting Scar.

which ultimately become white and glistening. Constitutional disturbances and pain are absent.

Gummata of the Skin consist of a sub-cutaneous infiltration of the connective tissue by a small-celled, granular, gelatinous substance containing some fusiform cells and small blood-vessels. These gummatous infiltrations are usually circumscribed, but may be diffuse ; they are painless. At first they are movable under the skin, but after a time they become

attached to the integument, and a purplish point appears upon the growth indicating inflammation. It then becomes sensitive, painful and ruptures, discharging thick, bloody pus, etc., resulting in a specific ulcer, with undermined edges, which may or may not heal. These gummata may be located on the head, neck or extremities.

Mucous Patches may occur and scaly patches are frequent. They differ in no special respect from similar lesions already described as happening during constitutional syphilides. In the sequela stage the destructive process is very pronounced and large areas of tissue are sometimes rapidly destroyed.

Owing particularly to the predilection of syphilis to attack parts supplied by the cervical portion of the sympathetic nervous system, the nose, throat and mouth, rarely escape some of the characteristic phenomena in the sequela period as well as during the constitutional stage.

Syphilitic Ulcerations of the Mucous Membranes.—Deep ragged brawny ulcerations are common, especially on the buccal mucous membrane, tonsils, arch of the palate and the posterior and superior walls of the pharynx. Their bases are pultaceous and livid, the borders are sharp cut. They are surrounded by dark-red collars, similar to the areolæ of the cutaneous lesions. The discharge from the ulcers is corrosive, irritating and scanty. They may remain stationary or slowly increase in size. They produce some pain which may be intense.

Ulcerations of the serpiginous variety sometimes occur in late syphilis. They are of a gummatus nature. They are generally located upon the upper part of the pharynx or other parts of the mouth and are usually painless. They generally remain stationary, but may cause much destruction of tissue and result in distortion of the parts from cicatrices.

Gummatous Ulceration of the mucous membrane is the most

serious and rapidly destructive lesion of syphilis. It consists of an infiltration into the sub-mucous tissue of a gummatous material, either circumscribed or diffuse. It may be connected with or situated beneath the adjacent periosteum of the bony walls of the pharynx, the hard palate, vomer or bones of the face. The growth at first appears as a yellowish swelling, not sensitive to touch, which soon increases in size, becoming œdematous, and red or purple in color. It ruptures and discharges a grumous substance, leaving a deep ulcer somewhat yellow in color, with red base and infiltrated edges. The ulcer degenerates and eats rapidly into the surrounding tissues, and may in one day destroy the hard and soft palate, the vomer, ethmoid, turbinated bones, etc., or it may extend upward and open the cranial cavity, causing epilepsy, etc. The ulceration is, as a rule, unattended by pain unless there is some external irritation, as in the act of swallowing food and fluids, which are frequently regurgitated through the nose.

Luetic Leucoplasia.—The tongue in the late secondary and during the tertiary period is often the seat of a leucoplasia or gummata. The early specific manifestations of a papular character are comparatively unimportant; they are generally located upon the tip and sides of the tongue, and are often annoying and painful. They are readily removed by general medication with proper antiseptic and hygienic attention. Leucoplasia on the contrary is often aggravated by anti-specific treatment, and mild antisepsis may even have a pernicious effect. Leucoplasia is recognized not only as a sequela of syphilis, but of over-antisyphilitic treatment, gout, rheumatism, the tobacco and alcohol habits, individual idiosyncrasy, or a combination of all. The condition may, therefore, be of non-specific origin, though it generally occurs in those who have been infected by syphilis and who have, even after proper admonition, continued to use tobacco and alcohol. It is due to a combined functional and organic disturbance of the

epithelium of the tongue, characterized by the development of whitish hypertrophied somewhat elevated plaques of extremely chronic nature, showing a tendency to recur after apparent recovery, and to degenerate, under meddlesome treatment, into malignant growths. Leucoplastic spots not only appear as distinct hyperplastic plaques varying in size and appearance, but may resemble pieces of wet chamois leather or thin layers of film or coagulated albumin. The deposit is composed of hypertrophied epithelium and the papillary elements of the mucous membrane. From some perversion of nutrition or from its position, it may become deeply fissured. Distinct ridges on the sides of the tongue next to the teeth often appear. Frequently the elevated hyperplastic plaques and papillæ become glazed, smooth, red and atrophied, accompanied by burning, smarting and irritation of the tongue; the tongue may become irritable and painful. The original plaques are often located along the sides or base of the tongue and on the sides of the frænum. Leucoplasia is without doubt due to some tropho-neurotic disturbance and is generally aggravated by the administration of Mercury, the Iodides or mild local cauterization.

Parenchymatous Sclerosis of the Tongue.—This lesion may invade both the muscular and mucous layers and cause pronounced hypertrophy of these tissues; however, when contraction of the new connective tissue begins, an atrophied condition results. On examination, the tongue is marked by the imprints of the teeth, giving it a lobulated appearance, the dorsal surface being traversed by furrows, which cannot be obliterated by stretching the organ. The indurated tissues are hard and cartilaginous and the mucous membrane over them is smooth and pale. The enlargement may be excessive and ulceration may occur.

Gumma of the Tongue.—This condition may develop at any time during the secondary or tertiary stages of syphilis,

and be of a superficial or parenchymatous nature. The gumma may be located on the upper surface and sides, but never on the under surface of the organ. When superficial, it involves only the mucous membrane, commencing as a small nodule which soon degenerates and breaks down, leaving a superficial excavation with perpendicular walls and infiltrated base often covered with a yellowish-white membrane. The parenchymatous gumma begins deep in the muscular tissue as a small, painless, circumscribed growth, which is often difficult of early detection. As it develops, the mucous membrane over it becomes elevated, stretched and slightly purple in color. Degenerative changes commence at the centre and extend to the surface of the tongue, when the broken-down mass is discharged and a deep circumscribed cavity with overhanging indurated walls is formed. While considerable tissue may be destroyed the ulcer eventually heals with comparatively slight apparent loss of contour of the tongue. It differs from epithelioma of the tongue in commencing deep in the muscular tissue and working outward, while epithelioma commences on the surface and eats inward. Gummatous ulcers are generally multiple while malignant ulcers are single. The glands of the neck are not coincidentally involved in gummatous ulceration of the tongue.

Syphilis of the Larynx.—The larynx is frequently involved in both secondary and tertiary syphilis; few syphilitics, at some period of the disease, escape lesions in this locality.

Laryngeal Erythema, involving the whole or part of the larynx and not attended with symptoms of any special character beyond a slight hoarseness, may occur during the constitutional period.

Superficial Ulcers of the larynx sometimes occur in the later period of the secondary stage; they are oval in form, surrounded by a deep red areola; their bases are red, smooth and covered with a grayish-yellow matter. They may be located

on one or both sides of the larynx, causing hoarseness and other laryngeal symptoms; relapses are common. When the epiglottis is involved, deglutition becomes difficult. The larynx above the vocal cords may become involved and infiltrated with a growth, which in healing may contract and greatly distort the form of the larynx, giving rise to hoarseness and aphonia; sometimes the growths ulcerate.

Laryngeal disorders may appear during the third year; they have been known to occur as late as forty years after the original invasion, appearing as gummatous ulcerations, vegetations, œdema and necrosis of the parts, which may terminate in stenosis, deformity and great impairment of the usefulness of the organ.

Deep Ulcers of the Larynx are usually single, but may be multiple; they are the result of gummatous infiltration and degeneration of the parts. The ulcers are deep, with sharp, adherent edges, the floor being covered with a dirty, yellowish-white deposit, and the tissue surrounding it purple in color. The epiglottis rarely escapes and the cartilage of the larynx may be involved. If the epiglottis alone is diseased there will be no distinctive change in the voice. When the ulceration is extensive the voice becomes impaired and there may be complete aphonia. Pain is generally absent, but the cough is troublesome, accompanied by profuse expectoration of pus, blood, broken-down tissue, etc. The respiratory act may be greatly interfered with by œdema, growths and contraction of the cicatricial tissue. Excitement, exercise, etc., may bring on paroxysms of asthmatic, convulsive cough.

Unless there is progressive destruction of tissue the prognosis is good, although local œdema or general exhaustion may prove fatal. Permanent impairment of the larynx with consequent hoarseness generally follow.

The Lungs.—In both acquired and hereditary syphilis there may be an involvement of the pulmonary tissue.

White Hepatization occurs only in new-born infants, commencing during intra-uterine life. A single lobe or the whole lung may be involved. The alveolar walls are thickened and infiltrated, the alveoli becoming filled with large fatty and swollen epithelial cells. On section the lung is grayish-white in color and sinks in water. The infant usually dies within a few hours or days after birth.

Fibrinous Interstitial Pneumonia may be caused by acquired syphilis. It consists of an interstitial infiltration and induration of the interstitial pulmonary tissue, which from its contraction may in time obliterate the air cells and result in consequent deformity of the lung. On section the pulmonary tissue cuts like cartilage, the cut surface being studded with yellow points, the walls of the bronchial tubes are thickened, dilated and distorted; the lung tissue does not crepitate on manipulation.

Gummata of the Lungs usually complicate specific fibrinous pneumonia. These infiltrations vary greatly in size, often becoming as large as an egg, are gray or grayish-red in color and are surrounded by consolidated lung tissue; they may become encapsulated and white in color. More commonly, they break down and open into the pleura or the nearest bronchus. There are no special signs or symptoms that distinguish gummata of the lungs from tubercular or catarrhal phthisis, but the specific history, which should always be considered and the condition treated accordingly.

Stomach.—Erythema of the mucous membrane of the stomach sometimes occurs during the early constitutional period of syphilis, causing indigestion, nausea and other functional disorders. It is generally of only a few days' duration.

Intestines.—During the third and later years of syphilis, gummatous growths may occur in the intestinal walls. These break down, leaving round or oval ulcerations, which may

open into the peritoneum or may heal, the characteristic specific scars always remaining. They are recognized by the luetic history, cachexia and the diarrhoea which is difficult to control, and are accompanied by pain, referred generally to the region of the gummatous ulceration. The stools being frequently black, there is sometimes an associated intestinal indigestion.

Rectum.—Syphilitic involvement of the rectum may manifest itself in three distinct forms: First, in early or late syphilis, particularly in women. It may appear as an indurating œdema of the rectum, accompanied by infiltration and deep ulceration, which, if left untreated, results in the formation of complete rings of connective tissue about the rectum. Second, true gummata. Third, a form of inflammation with the production of new connective tissue from which exudation products are absent. As the infiltration and induration advance, stricture of the rectum is produced by the contraction of the newly-formed tissue. Above the stricture the rectal mucous membrane becomes livid. This strictured tissue is characterized by being less distensible than normal, excoriated, often ulcerated, and is attached to the muscular tissue by infiltrated growths. During the early period of the lesion the stools are small, frequently accompanied by mucus and blood; they finally become small, flat, ribbon-like and enveloped with mucus.

Anus.—This may be the seat of erythema, papules, mucous patches, vegetations, ulcers, etc., requiring general or local treatment.

Liver.—Diffuse Parenchymatous Hyperplasia of the liver in hereditary syphilis is of frequent occurrence. It consists of a luetic infiltration of the parenchyma and vessels of the organ, the liver cells being compressed and distorted by its presence; it neither degenerates nor breaks down, but the liver slowly becomes greatly enlarged and tense, hard and resistant,

giving it the color of flint. In acquired syphilis the hyperplasia is circumscribed but after a variable period contracts, resulting in a deep cicatrix which greatly distorts the liver and may divide it into two parts, the tissue between them being normal. Amylôid or fatty degenerations are often the result of a chance syphilitic contamination of the system.

Gummata.—One or many of these specific lesions, varying from one-sixteenth of an inch to two inches in diameter, may be scattered throughout the liver. When located upon the surface of the organ they form nodules. The capsule of the liver is always thickened. The gummata undergo degeneration and are surrounded by dense, interlacing connective tissue which may extend through the organ. They cause contraction and puckering of the surface. Percussion and palpitation reveal a liver enlarged, irregular and nodular, the local lesion being accompanied by pain, jaundice and specific cachexia; sometimes there is albuminuria, though the symptoms are not characteristic except when taken in conjunction with the syphilitic history.

Spleen.—This organ may have accompanying connective tissue and gummatus deposits; there is no special clinical history.

Kidneys.—Acute Syphilitic Nephritis.—This manifestation of syphilis frequently develops early in the secondary stage, *i. e.*, eight to twelve weeks after the original chancre. Albuminuria occurs in about 4 per cent. of all syphilitics. The uriniferous tubules becoming congested, the gross appearance of the kidney is very similar to that of exudative nephritis occurring after scarlet fever. Micturition becomes frequent, the urine is reduced in quantity and contains albumen, blood, epithelial, hyaline and granular casts. Œdema may be general or amount only to a slight puffiness under the eyes. Headache and slight digestive disturbances are common. Resolution is rapid.

Chronic Syphilitic Nephritis.—In the later stages of syphilis, interstitial hyperplasia, gummata and amyloid degeneration may develop without special symptoms except the presence of albumen and casts in the urine. The kidney may show amyloid degeneration, interstitial inflammation, or developing gummata; the three conditions are frequently associated, the amyloid predominating. The symptoms vary little, if any, from those of chronic nephritis. As the disease advances and the gummatus growths break down, the urine becomes turbid, of a dirty brown color, contains albumen, a large quantity of detritus, with blood and epithelial cylinders.

Bones and Cartilage.—In the secondary period of syphilis the periosteum of the bones may become involved; accompanied by many pronounced subjective and objective symptoms.

The bones themselves are rarely implicated. When they do become diseased they yield rapidly to treatment. In late syphilis the involvement is more pronounced and there is a tendency to destructive changes even under the best treatment.

Osteo-periostitis, in which the lesion is confined to the periosteum and the superficial layers of the bone, occurs pre-eminently, on the tibia, ulnar, clavicle, sternum and cranial bones, presenting ill-defined doughy tumors of various sizes, shading into the various surrounding tissues, but not being in any way connected with the skin covering them. These growths are called nodes. They may be so small as to be practically impossible of demonstration, their diagnosis depending upon the characteristic nocturnal pains and their sensitiveness to pressure; the pain may be entirely absent during the day. If appropriate treatment is not instituted, the overlying integument may become thinned, reddened and adherent to the inflamed bone tissue. Degeneration occurs, the node softens and finally breaks down into an

ulcer, from which pieces of necrosed bone escape. The ulcer eventually heals, leaving an adherent cicatrix.

Gummatous Osteo-periostitis and Osteo-myelitis.—These specific infiltrations which occur only in late syphilis may be circumscribed or diffuse and involve the cranial and long bones as well as those of the fingers and toes. When the process involves the cranial bones, one or more nodes slowly develop, producing a varying degree of deformity of the head, accompanied by pain and sensitiveness, particularly aggravated at night. These growths may resolve, or break down and ulcerate, and on healing leave adherent pigmented cicatrices. The nasal bones are often attacked and the sunken nose results. When the superior maxillary bones are involved there will be an associated red, œdematous swelling around the eye; the bone may be entirely destroyed. The inferior maxillary is prone to involvement on its lower border, which may so weaken the bone that spontaneous fracture may occur. On the clavicle and scapula the gummatous mass has been mistaken for a cold abscess. Gummata of the vertebræ are not uncommon. When fracture of a bone occurs in a syphilitic the new-formed tissue often, in place of producing a callus, forms into a caseous, fatty or sclerotic tissue, with a resulting false joint.

Necrosis.—In the tertiary period, destruction of the bony structures is common, necrosis *en masse* occurring without pronounced pain or special local disturbances. The first local manifestation may be a small focus of ulceration over the section of dead bone from which there may ooze a drop or so of pus, the introduction of a probe through the opening revealing the presence of a piece of dead bone, which on examination shows it to have been separated as closely as though cut with a knife, the ulcerating opening being Nature's method of removing the dead tissue. The process is sometimes called dry necrosis. The death of the bone is due to the cutting off

of the nutritive supply and is of tropho-neurotic origin. This form of syphilitic necrosis occurs particularly in the alveolus of either maxillary bone; the palatine processes of the superior maxillary or the inter-maxillary, with loss of the incisor teeth, a condition which transpires without pain and is pathognomonic of late syphilis.

Exostosis.—This disease may assume the nature of a formative osteitis exostosis. The new bony growth may at first be somewhat movable and is designated as epiphyseal exostosis. These growths are small in size, thin, flat, hemispherical or pedunculated, at times annular, and are entirely periosteal in origin. They finally become of an eburnated texture, previous to which stage they may yield to treatment. It is called parenchymatous exostosis. The growths rarely produce sufficient deformity to necessitate surgical removal, though when they develop on the inner surface of the cranial bones serious if not fatal nervous conditions may result. The exostoses are rarely symmetrical and are always accompanied by nocturnal pains which are amenable to antisyphilitic treatment even when no effect is produced upon the growths.

Muscles and Tendons.—Specific rheumatism is not infrequent. It is usually mono-articular and is characterized by the sensitive and painful points around the joints, with nocturnal aggravation of the pain.

Dactylitis.—The fingers and toes of syphilitics are sometimes attacked by a gummatous infiltration. The disease has received the generic name of dactylitis (Fig. 170). There are two varieties. In the first the connective tissue and fibrous structures of the joint only are involved. In the second, the lesion commences in the periosteum and finally involves the joint and subcutaneous structures. One or more fingers or toes become gradually swollen. When a finger is attacked one phalanx alone is usually involved, the condition not spreading to the remaining phalanges; but when the lesion

occurs in a toe the whole member is implicated. The parts become enlarged and tense, less flexible than normal, and of a reddish color as the infiltrated area becomes attached to the over-lying skin. The development of the swelling may or may not be accompanied by dull pain. It is not always possible to ascertain whether or not the bone is involved, though as the inflammation subsides it can generally be demonstrated.



FIG. 170.—Syphilitic Dactylitis. (Chapin.)

After a few weeks the associated joints become involved, flexion being at first impaired but after two or three weeks unnatural mobility, hydroarthritis, and at times some crepitation can be demonstrated. This variety of dactylitis rarely undergoes ulcerative degeneration.

In the second or gummatous form the lesion commences in

the phalanx. It may be confined to the bone alone or the over-lying tissues may be included. It is a late manifestation, and may be slow, rapid or intermittent in its development. When one bone only is affected the intensity of the process is greater than when several are involved. When the first phalanx of a finger is attacked the parts resemble in form an acorn; when the second phalanx, it assumes a fusiform contour. The toes are not as frequently involved as the fingers. The skin is thinned from tension, and, if the growth is rapid, it may become red and inflamed.

If dactylitis is allowed to proceed without operative relief for the tension, pain, etc., the pus will focus at and open upon the sides of the finger and a varying amount of creamy material, pus and bone tissue will be discharged. Resolution may occur without special deformity. Crepitation from apposition of the erroded cartilaginous ends of the bones is not uncommon. Hydroarthritis may develop with resulting increased mobility, or there may be thickening of the parts and stiffening of the joint. Sometimes the gummatous mass is absorbed with shortening of the finger. The process of evolution always bears a ratio of progress to its development. Sometimes the necrosis is pronounced and a large portion of the phalanx is destroyed, with great resulting deformity. The tendons and their sheaths in the fingers are never involved.

Syphilophobia.—This mental condition, which is illogical and not warranted by the facts of modern medicine, frequently invades not only the mind of the patient but that of the medical adviser. It is characterized by a morbid tendency to attribute every ailment of the individual, who has been so unfortunate as to contract syphilis, to the luetic infection, not only during its active period but long after it has become extinct. Because one has had syphilis is no criterion that he may and will not have ailments due to other causes.

SYPHILIS OF THE NERVOUS SYSTEM.

CONTRIBUTED BY JOHN E. WILSON, M. D.

Syphilis, when it secures a firm grasp upon the human organism, affects one structure after another in the various periods of its activity and the nervous system suffers with the rest.

Ambrose Paré (1510-1590) says, in speaking of Lues venera—"Others become lame of their arms and others of their legges and a third grow stiff by the contraction of all their members so that they have nothing left them sound but their voice, which serveth for no other purpose but to bewail their miseries, for which it is scantily sufficient neither is their case much better who, having their brains tainted with this disease, have their whole bodies shaken by fits of the falling sickness."

Gowers, at the present day, says: "Among visceral effects of syphilis those upon the nervous system stand first in extent, variety, and frequency."

In the later periods it seems to be especially vulnerable and Hielman states that, leaving out of the enumeration cases of tabes and parietic dementia, $11\frac{1}{2}$ to $21\frac{1}{2}$ per cent. of all syphilitics develop cerebro-spinal lesions, and that of those presenting the tertiary symptoms, 12 per cent. show invasion of the cerebro-spinal axis. Fournier puts this last class at 21 per cent. This condition does not seem unnatural when we realize how direct are the avenues of infection by the blood supply and peri-neural lymph spaces, and remember that nerve cells are especially susceptible to intoxications of all kinds.

Pathological Anatomy.—In order to correctly interpret the manifestations of syphilitic disease in the nervous system, we must recognize that it may affect any or all of the structures—the brain, cord, nerves, membrane—in themselves, and also

that diseases of the bony envelopes may affect any of the foregoing structures in a secondary way. All of these effects, however, are produced by one of two processes :

1. The direct microbic infection, which we call syphilis.
2. The action upon nervous elements of the late toxins, or as some term them, secondary toxins.

These two, however, act always by,

1. Lesions of the vessels leading to occlusion, that is, by partial or complete thrombosis.
2. Lesions of vessels leading to exudates, namely, gummata ; or by
3. Intoxications acting directly upon nerve cells and fibres.

These vascular lesions exhibit :

1. Simple arteritis.
2. Obliterative endarteritis.
3. Gummatous periarteritis. (Charcot, Ribot, Bumstead and Taylor.)

Endarteritis is much the most common, generally located in the great arteries at the base of the brain, yet syphilitic new growth in other localities generally shows this change ; essentially it is progressive thickening of the vessel wall.

Next, a narrowing of the tube, extensive or slight, or enough to completely close the tube.

The texture of the tube changes, it becomes grayish-white instead of pink, its consistency is so increased that the vessel does not collapse upon being emptied, and it may be so stiffened as to be almost cartilaginous.

The change is in the intima, the endothelial cells are proliferated, the adventitia is also invaded.

Köster and Baumgarten believe that the whole process takes its origin from the vaso vasorum ; the media and intima share in this process, since they are nourished by absorption from the vessels of the adventitia.

The termination of this invasion is a limitation of the

process, with an absorption of the infiltrate and shrinkage of the outer coats of the vessels, but they may become fibrous, and hence disposed to aneurysm.

The process may go on until from tubes they are converted into hard fibrous cords.

The process in an early stage may block the vessel.

This is a different process from atheroma, not only in causation, but also in termination, and it is stated (Heubner) that the changes in the inner coat always go on to fibrosis and never to caseation or calcification, as in atheroma.

This is the usual arterial change from which all nervous symptoms arise. Gummatous arteritis consists in the formation of small-cell nodules in the adventitia.

These may caseate, or disperse into more or less extensive deposit about the vessels.

This results in a gumma.

Let this occur in the substance of the brain or cord, and we have a tumor of nervous tissue.

On a bone, and we have a tumor also.

On the pia, it is usually a diffuse plastic mass, but still is dominated gumma. It is gelatinous, transparent and pinkish.

When a gumma is situated in the substance of nervous tissue it not only produces pressure and destruction of that area, but its presence causes also a simultaneous proliferation of the adjacent neuroglia.

Beginning like scattered granules—like rice grains—they later coalesce into rounded irregular knob-like eminences of the size of a walnut or even larger, which are of the consistency of firm jelly. They show a reddish-gray periphery, while the central parts are yellowish, dry, or viscid, or at times caseous.

Situation.—A gumma of the meninges infiltrates by preference the region about the circle of Willis and of the optic chiasm.

We may have instead of a distinct gumma, a slowly growing diffuse osteoma, or a circumscribed thickening of the cerebral membranes which may make them adherent and indistinguishable from one another and thus cause a chronic indurative pachymeningitis which is frequently the only pathological change to be found in syphilitic dementia.

The degenerations of later years which clinically are considered syphilitic and where the essential elements of the brain and cord are diseased may show an arterio-sclerosis as their only pathological basis, and this not distinguishable from that arising from other causes.

Locomotor ataxia may arise from a degeneration of the posterior root fibres at any point in their course, and all nuclei may degenerate in the most random fashion, leading one to believe that these results were the primary action of an intoxicant and not the final effects of an arterial change. Such degenerations may occur in the very inception of the disease, and it is most probable this is the explanation for the later degenerative manifestations. Hitzig and Strumpel have thought that in the original infected sore—the chancre and perhaps the chancroid—there is in some cases besides the specific germ a secondary micro-organism, and that while the original poison produces its well-understood effects upon the arteries, this additional toxin, sometimes primary, but generally secondary—has a selective action upon the nerve elements themselves.

The injury to the nervous system from a syphilitic invasion has been considered to be an incident of the later period of its activity, but as a matter of fact the possibility exists at any period from the first two weeks up to thirty years from the original infection.

The comparison of a number of series of cases of nervous syphilis demonstrate that 23 per cent. showed brain symptoms within the first year; 72 per cent. within two years; a

majority of the remaining cases within the next twelve years ; a very small per cent. of the whole number after the tenth year. This demonstrates that the envelopes and vessels of the nervous system show the effects of the disease not at a late but at a very early period.

It has been said that the younger the patient, the more deferred would be the manifestations, but this cannot be substantiated by statistics.

It is a notable fact that some cases of the late syphilitic diseases, namely, tabes and paresis, show no history of well-marked secondary symptoms, giving one the impression that the grade of severity of the original infection furnishes no basis for the prognosis of future nervous results to the victim.

It has also been said that while a thorough mercurial treatment benefited the immediate symptoms of the initial disease it tended to induce nervous degenerations later through the injurious effects of the drug upon the walls of the arteries. A study of a series of thirty cases of locomotor ataxia examined by the writer seemed to show, on the contrary, that the more vigorous the early treatment, by so much later the tabes. The writer has, for example, seen a case of tabes of undoubted syphilitic causation, which had been treated by a homœopathic physician in a most careful manner—this case was probably treated absolutely without Mercury in material doses—and yet it developed a typical tabes of great severity in about twelve years.

Classification. — The syphilitic diseases of the nervous system are divided into early or late—or degenerative.

By Gowers they are denominated Specific and Degenerative.

By Fournier, Syphilitic and Para-syphilitic.

The active syphilitic, or specific nervous lesions, or early, are cerebro-spinal syphilis, which may be acquired, hereditary, early, late.

Cerebral syphilis, which comprises cerebral meningitis, cerebritis, arteritis, neuritis of cranial nerves, any of which may be accompanied by, or induce mania, melancholia, pseudo-paresis.

Spinal syphilis, which comprises meningo-myelitis, myelitis, spinal paraplegia, syphilis of spinal nerves.

The para-syphilitic diseases are of two classes, acquired and hereditary.

Acquired: Tabes, paretic dementia, muscular atrophy, certain forms of; ophthalmoplegia, hysteria, epilepsy, neuralgia, neurasthenia.

Hereditary: Juvenile tabes, infantilism, hydrocephalus, cerebral or spinal agenesis, mental defect, early simple meningitis, paretic dementia.

Cerebro-Spinal Syphilis presents the effect of an invasion of both the brain and the spinal cord. Its symptoms will be found under the separate divisions. It is worthy of note that while most cases of spinal syphilis show a cerebral involvement, cerebral syphilis may go to its end without showing any spinal symptoms.

In the experience of the writer a man of thirty died of cerebral syphilis within two years of the primary infection. His cranial symptoms were varied and of the utmost severity but were not attended by any symptoms of invasion of the spinal cord or meninges.

Cerebral Syphilis. — The syphilitic brain diseases most often occur in the first year; a large percentage in the first one or two years; after the tenth year, as has already been said, the nervous system is rarely involved by specific invasion. Cerebral symptoms have been noticed at the beginning of the secondary stage, within a few weeks, or at the most a few months, after the infection. The earlier period is the most common. It should be remembered that treatment at this time gives the only promise of real cure, since definite

changes take place with great rapidity. Of 754 syphilitics treated at the Hospital in Helsingfors, Henschau noticed that 112 had brain syphilis. Observers have so often noted that the first symptoms of brain involvement have occurred soon after head injuries, mental over-exertion, strong emotion, fright, alcoholism, that it must be conceded they are localizing causes.

At the inception of this process we have a gradual diminution of the calibre of arteries and veins (Rieder). This produces a malnutrition of the brain and cord. It may be benefited by the use of tonics and stimulants, but the relief is only temporary as the process continually tends toward thrombosis, and when this occurs we have a cerebral or a spinal apoplexy, which may pass away to some degree, but nevertheless leaves a spot of permanent injury from the subsequent softening. In the second place, we may have the direct toxic action, which injures nerve cells, and does not in this case act through the arteries, yet produces at first a similar neurasthenia.

Both lesions tend to disturb sleep. The patient generally has insomnia, but he may have stupor; he is pretty certain to have headache, which has a peculiar nightly exacerbation and is very persistent; he is liable to be disturbed in temper and in intellectuality, but in this state he is most possibly curable. If, now, the disease is not in this, its premonitory form, but in its well-defined stage, the condition is a meningitis, and whatever other symptoms arise later this will always be a complication. Clinically speaking, this is always basilar, even when the symptoms point to the convexity as its sole location. Post mortem, we always find the base affected, and especially that space lying between the peduncles. This basilar invasion is strikingly like that of tuberculosis. Either the dura or the pia, or both, are affected. The pathology differs, however, in that the thickening of the dura is due to

an increase in the fibro-elastic constituents, while the changes in the pia arise from a diffuse cellular infiltration. The chief symptoms are produced by the involvement of the cranial nerves, which naturally results from the gummatous meningitis, or those isolated gummata which are found here.

Isolated gummata spot here and there the tissues or project from the prominences, but most often there is a diffuse gummatous exudate enveloping in some degree all of the structures at the base. These nerves or vessels are encroached upon by the exudate and are injured by this pressure and tend toward atrophy. Nerves, too, may be not only surrounded by this tissue, but may themselves be altered and swollen, and a cross section will show a glossy, or gray, or yellowish-white structure, diagnostic of some degree of atrophy. This is not always true, and sometimes the emergent nerves may be absolutely intact. There is a definite order of invasion according to which these cranial nerves are generally attacked. The order is this in point of frequency: 2d, 3d, 5th, 6th, 7th, 8th; more rarely, 9th, 10th, 12th.

On account of this the most common results are :

1. Bi-temporal hemiaopsia.
2. Third nerve palsies, especially fibres to levator palpebra.
3. All grades of optic loss, even to complete blindness.
4. Crossed hemiplegia of Leyden, which consists of homonymous (that is, hemiaopsia on the right or left in both eyes) hemiaopsia of the one side and a hemiplegia of the other. This is peculiarly diagnostic.
5. Ophthalmoplegia occurs but rarely, and if 4th or 6th nerves (namely, nerves to the sup. oblique and external rectus) are affected, they are much more likely to be so in conjunction with palsies of the 5th and 7th, respectively.
6. Partial and complete palsies of the nerve trunks are also common, *e. g.*, the 3d nerve palsy of the fibres to the levator palpebri superior.

7. Trigeminal nerve palsy as an isolated symptom is found **marked** by anæsthesia of the cornea, face and mucous membrane supplied by it, and, if the motor branch is implicated, **by** palsy of the masticatory muscles.

8. Facial palsy occurs in only 3 per cent. of the purely **peripheral** palsies (Philip and Hubschmann), but facial palsy **complete**, with deafness on the same side, is pathognomonic **of** basilar meningitis, and suggestive of a syphilitic causation.

9. Bulbar palsy, unilateral, is rare, but has been seen. **Will** produce palsied soft palate, vocal cord, tongue, hemi-atrophy on the side of the lesion.

10. Spinal accessory has an intracranial course, hence, we **may** get a palsy of the sterno-cleido mastoid and of the upper part of the trapezius.

It may be seen that gummata in these localities could produce any of the above palsies by direct pressure. It might be conceived that there could be a gumma of the nerve substance itself, but in fact such a growth is extremely rare.

Syphilitic Cerebritis.—The exudation upon the meninges is not confined to these structures, but may extend for a variable distance into the cortex, destroying and altering the structures by direct inflammatory changes and by pressure.

This division, then, would represent those cases whose symptoms were focal or mental, without signs of mechanical interference with nerve trunks in their course, but indicating rather gross central lesions. Epileptiform seizures are usually caused by actively growing gummata, starting from a fold of pia-arachnoid and extending into the cortex or originating there. A diffuse gummatous condition of the cortical meninges has produced these seizures by its interference with circulation and consequent cell-degeneration. A contracting cicatrix from a gumma or the absorption of toxins from the rapid breaking down of gummatous growth under their rapid

resolution by treatment have produced the same result. Monoplegia, hemiplegia, and aphasia may arise from a similar cause.

Gumma of the brain, as has been said, arises most frequently from the cerebral meninges and their infolding or projections, even if the growth is found in the centrum semi-ovale or in the basal ganglia. It may arise from the adventitia of a blood vessel anywhere in the brain. While the wide possible distribution of gummata is well-proven it must not be forgotten that the epilepsy which arises at times may not be always the mark of a structural change, but during the secondary stage may be a pure syphilitic intoxication of the cells, and the insanity of the first stage may have no more of a material causation (Fournier).

Cerebral Syphilitic Arteritis.—Rare, but may exist in any one of the cerebral arteries without any other affection of the brain or its membranes. It is frequent in the basal ganglia (Hubner). The middle and cerebral arteries are frequently affected, either in the numerous small branches of the Sylvian, or of this main vessel itself—nineteen out of twenty cases (Gowers). This endarteritis is often secondary to a gummatus meningitis, and its legitimate result is a localized anemia, resulting in a softening of that area of the brain. It is also certain that central hæmorrhages may follow in specific arteritis. The location is not often in the brain substance, but generally in the large and comparatively unsupported basilar vessels, and results in an apoplectic stroke without premonitions, and almost immediately fatal.

Brain syphilis, in all of its manifestations, has almost always an affection of the arteries as its basis, but some peculiar symptoms exist which are the direct and primary result of these arterial changes. Aphasia and hemiplegia are the symptoms most conclusively pointing to arterial obstruction. The aphasia is partial or complete; continuous

or intermittent; often sudden in onset; may be the only symptom, or may occur before or after a graver complication.

The hemiplegia is peculiar in that it has premonitory headache. Hemiplegia not attended by unconsciousness may be followed by another attack on the same or opposite side.

When the pons varolii is the site of the lesion, we get a peculiar combination of symptoms, since here there is an extremely close grouping of sensory and motor pathways, and also nuclei of cranial nerves.

Softening of the pons as a whole is most often due to syphilitic thrombosis of the basilar artery and its branches, and in that event motor losses predominate over sensory; but if the tegmentum only is affected, there will be disturbances of the fifth, sixth, seventh, and eighth nerves, and of sensation and coördination. If the crura are affected, we find disturbances of the movements of limbs, as well as of the functions of the seventh, tenth, eleventh, and twelfth nerves.

If the pons is softened as a whole, we find the following symptoms:

1. The limbs may be paralyzed and the cranial nerves escape.
2. Cranial nerves are affected and the limbs escape.
3. Paralysis of face and limbs on side opposite to the lesion—this locates the lesion above the decussation.
4. The most characteristic form is a paralysis of the fifth, sixth, and seventh nerves on side of lesion, and the limbs and tongue on the other. Here the lesion is below the facial or seventh nerve decussation.
5. Bilateral paralyses are common owing to the close proximity of the structures, and also because they are generally due to a thrombotic occlusion of the basilar artery which is the common source of the blood supply to both sides of the pons.

Disorders of sensation are common and almost always in the direction of a diminution.

Ataxias are common, because in the pons are the nuclei which are the relay-stations for the middle cerebellar peduncles; this lesion gives rise to reeling, unsteady, cerebellar gait; affections of deglutition and articulation, particularly of the latter. They are very pronounced in complete thrombosis of the basilar artery (Hoppe).

Sudden hæmorrhages in the pons are almost certainly marked by fever; in occlusion this fever is preceded by a marked fall. Softening is marked by a subnormal temperature. Pupils, in sudden lesions, are apt to be minutely contracted. Pontile lesions, while grouped variously, are in general apt to be marked by nerve lesions of the one side, limb palsies of the other.

Neuritis of Cranial Nerves. — It has been said, when speaking of gummata at the base, that a nerve might be swollen and affected or might emerge intact. When, however, the nerve is affected, it is by a round cell proliferation along the epineurium. This thickened and infiltrated structure sends its processes everywhere between the bundles of nerve fibres, and by this process new tissue is formed, which distends the nerve trunk itself to four or five times its normal volume. Later, however, there will be contraction and the nerve will become atrophic. This process is especially found on the optic and oculo-motor nerve.

There have been cases of true peripheral neuritis affecting the spinal nerves, and the cranial nerves, without doubt, may be affected in the same way, but instances of this process in either locality are extremely rare.

The Symptomatology of Syphilis of the Brain, notwithstanding its variability, is very characteristic.

Headache: Usually bilateral; constant or intermittent grinding, boring, hammering in any or all regions; nocturnal

in aggravation; generally amenable to anti-syphilitic treatment, but at times uncoercible; skull generally tender to percussion; insomnia, but at times stupor, not constant and progressive as in tumor; vertigo; intellectual hebetude; apathy; psychoses, melancholia, hallucinations, vague terror of self-destruction or injury by others; photophobia; marked cachexia; chorea or choreiform twitchings; patient may be confined to bed and show ataxia, paretic symptoms, delirium usually; slight, constant, intermittent contractions of muscles or groups of muscles; swaying of the head or body from side to side, or from before backward; this usually ceases in sleep; paralysis, sensory or motor, of muscles which have previously been twitching; special senses, also subject to paralysis; hemiplegia, sudden, in a patient under 50, preceded by headache, vertigo, lassitude, neuralgias, parathesias—is generally syphilitic.

When the combination of symptoms is such as would cause doubt as to its causation, the variability of the symptoms, their coming and going and constant change, would point to syphilis. This active variation in the phenomena is to be explained by the pathological alterations. The new granulation tissue proliferates rapidly, dies as rapidly, and the process is repeated again and again. Such growths are the site of great contraction, and the nerves which are surrounded by them are subjected to a greater degree of variability of pressure than is known in any other disease-process.

Spinal Syphilis.—Syphilis of the spinal cord and its membranes is most frequent from the third to the sixth year of the disease history. As within the skull, so in the spine, it is usually a disease of the meninges, the blood-vessels and the nerve roots, but occasionally is a periostitis with resulting caries. The cord-changes themselves are generally secondary and due to pressure, and the usual symptom-complex is a meningo-myelitis, since circumscribed tumor formations and

multiple gummata of the cord are much more rare than in the brain. The usual lesion is a general, though irregular thickening of the pia-arachnoid throughout the greater part of the spinal canal. The spots may be only microscopical, or in other places there may be an enormous infiltration of round cells, and the growth may be fibrinous or quite gelatinous, and in some cases is extremely vascular. The dura may show no signs of being thickened, yet may be so to any degree, and generally then upon its inner aspect, which causes it to adhere to the pia-arachnoid and turns the separate structures about the cord into a matted mass. Such changes, while irregular and leaving the membranes quite free in certain parts, show some tendency to localize about the posterior roots, and gummata may develop in this new tissue. Hæmorrhage may occur in it.

The foregoing is a picture of a specific meningitis, and it may extend only to the periphery of the cord, or it may invade it by sending fibrous processes into the cord, which produce atrophy and inflammation of the tissues which they penetrate. The impairment of the blood-vessels by endarteritis, phlebitis and thrombosis sets up another group of conditions, as they tend to cause softenings and changes that are similar to a focal myelitis, or, by diminishing the blood supply of the posterior arterial field, they may induce scleroses of the posterolateral portion of the cord. Considerable hæmorrhage and cavity formation has been observed, and isolated gummatous tumors have been found in the spinal cord. It may be considered a rule that spinal syphilis is multiform in localization and that the picture presented will be varied by two factors:

1. That various parts of the structure will be simultaneously affected.

2. That the variation of type of lesion may be great in any single case as time goes on; that is, a case may begin as a meningitis, may become a meningo-myelitis, then may set up

a combined sclerosis, and may terminate in softening, consuming many years in this evolution.

Spinal Meningitis and Meningo-Myelitis, as has been said, are the most frequent expressions of the disease and may be described together. They are like similar changes occurring from other causes, the principal symptoms being pains, palsies.

Pains are the onset feature; extremely intense; nocturnal exacerbation strongly marked; located usually in the lower extremities, and with them is associated intolerable backache in the lower parts.

These pains are root pains and may be identified by the discovery of tenderness on nerve trunks, herpes, glossy skin, which is a form of atrophy.

Palsies rarely complete. Partial palsy of certain muscular groups, with disturbed sensation in those areas of the skin which draw their sensory fibres from the nerve under examination, is occasionally seen, and is confirmatory of the presumption that it is a neuritic and root disturbance.

Legs become weak, often more on one side than the other.

Paraplegia may ascend to any level, but most frequently remains below the waist line.

Upper extremities may be simultaneously affected, or even affected alone.

Klumpke's paralysis, from implication of the eighth cervical and first dorsal roots, has been caused by syphilitic meningitis. This consists of a paralysis of the small muscles of the hand, of the muscles of the forearm, especially flexors; sensory disturbances in the region of the ulnar nerve, as well as of the inner side of upper arm and forearm.

Pachy-meningitis cervicalis has been found with all its characteristic deformities, looking as though there had been a spinal extension of a basilar meningitis.

In the paraplegias there is a tendency to spasticity, although at the first the members are relaxed and enfeebled. The

sensory disorders are usually the first symptoms, and next a feeling of heaviness and clumsiness in the legs ushers in the paraplegias.

As in all syphilitic troubles, there is usually a series of remissions and progressions until finally the paraplegia is established.

At times a Brown-Sequard paralysis has been found, the result of a transverse destructive lesion of one-half of the cord. This causes a complete loss of power below the lesion on the same side. There is also a slight loss of power on the opposite side. Anæsthesia is complete on the side opposite the lesion for the reason that the sensory paths enter the cord and cross to the opposite side before ascending. The muscle sense may be more or less completely preserved in the above mentioned area. On the same side of the body as the lesion, there is a band of cutaneous anæsthesia, due to a destruction of the entering sensory roots, which mark the exact site and vertical extent of the lesion. There is a band of hyperæsthesia, both above and below the band of anæsthesia, due to irritation, not destruction, of the sensory roots entering at those points. On the opposite, *i. e.*, anæsthetic side there is a hyperæsthetic band lying above the anæsthetic area, but below that on the opposite side, due also to sensory root irritation. The bladder and rectal functions may be disturbed, but that is not a constant sign.

In addition, the reflexes are increased below the level of the lesion on the paralyzed side, but are abolished at the level of and throughout the vertical extent of the lesion. Occasionally gummata in the meninges, by the formation of tumors, give rise to the Brown-Sequard syndrome.

In the annular invasion of the cord, the blood supply is interrupted from both arteries and veins; they suffer from endarteritis and the endothelial changes may lead to ischemia, softening, or hæmorrhage. Combined sclerosis naturally result from such lesions.

Acute Syphilitic Myelitis, or Softening, is not universally conceded to exist. Gowers denies its frequency. When present, the areas of softening are usually in the gray substance, and are due to a thrombotic occlusion of the vessels, an obliterative arteritis or phlebitis, with or without an accompanying meningitis. There is usually great cellular activity, and secondary hæmorrhages may occur. A complete cross section of the cord occurs very rarely. The symptoms are those of an acute myelitis: Onset sudden; paraplegia; sensory disturbances in corresponding areas; sphincter incontinence; spasticity after a few weeks.

Syphilitic Ataxic Paraplegia.—Erb, in 1892, called attention to its frequency and uniformity, and termed it syphilitic spinal paralysis. This is the commonest syphilitic disease of the spinal cord. Ninety per cent. of syphilitic paraplegias are male; 50 per cent. of all paraplegias occurring in males under forty are syphilitic. Onset insidious, taking weeks, months, or even years, for its development. Heaviness and paræsthesias in the legs are the first symptoms; difficulty in emptying the bladder on account of spasm of the sphincter, soon follows; spasticity of the legs next; gait uncertain, with dragging toes and adducted knees; knee jerk well marked; rectus and ankle clonus; Babinski's toe sign; muscular strength reduced; sensory disturbance slight or entirely absent; upper extremities often affected, but less than lower; pupillary disturbances not uncommon; course slowly progressive, inclined at times to be stationary, or may improve under antisyphilitic treatment.

The condition may arise as a secondary of a meningo-myelitis. It is clearly due to vascular disturbance in the posterior arterial field, since we know that the gray matter of the posterior horns, and also the lateral and posterior tracts, draw their blood supply from the same vascular system.

Diagnosis of Spinal Syphilis.—If the cerebral lesions are

absent, we may be unable to state accurately the cause of the disturbance, although the nocturnal backache and the characteristic advance and retreat of the symptoms may lead us to suspect it. A clear history of an infection only will clear away all doubt. In the combined scleroses a cerebral involvement is rarely lacking, and practically we need only to exclude tabes, which is easily done by an examination of the knee jerk and the discovery of the other objective signs.

Syphilitic Spinal Neuritis is usually of a single nerve, and not so often spinal as cranial. A true parenchymatous syphilitic poly-neuritis has occasionally been seen, in which case the sensory fibres are affected at the periphery. Like symptoms may also be caused by alcohol, arsenic and other poisons, and the disease is called peripheral neuro-tabes.

Multiple Syphilitic Neuritis has been found, but is exceedingly rare, and generally is in a minor degree of intensity (Casten could collect only fourteen cases from all literature). The sciatic, intercostal, or some branch of the brachial plexus may be affected, and such lesions are often bilateral.

Hereditary Cerebro-Spinal Syphilis may occur in the early years of life, may be deferred until puberty, and occasionally does not appear until the third or fourth decade. It is provoked by almost any of the numerous forms of injury to the nervous system. It is recognized by the presence in the patients of the syphilitic stigmata, such as Hutchinson's teeth, hydrocephalus, idiocy, cachexia, syphilitic skin diseases, choroiditis, but a history of parental syphilis must often be relied upon for a diagnosis.

The symptomatology is in general the same as in the diseases just discussed, but the prognosis is worse than in the acquired form, and there is a very marked lack of mental development, and epilepsy is a prominent symptom.

Parasyphilitic Diseases.—These diseases are not marked by round cell invasion nor gummatous processes, neither are

they directly amenable to specific medication, since they are not inflammations but degenerations. They seem to be attributable to a late toxic or chemical property, which was developed secondarily to the active infection and may exert its influence in a hereditary way, or, as is more common, follow, after a long interval, the acquired syphilis. The chief among these parasyphilitic diseases are tabes and parietic dementia.

While these diseases are usually post-syphilitic, there are cases probably which are degenerations arising from other causes.

The frankly syphilitic tabetic does not present such a pure and typical form of the malady as the presumably non-syphilitic; the disease tends to be more random in its manifestations and irregular in the order of their appearance.

Syphilis may develop a paresis, but it is a curable paresis. It is distinguished from the late or classical form by the fact that the syphilitic parietic shows a marked cachexia. The true parietic is a healthy fool.

The care of the tabes and paresis of late syphilis deserves no particular mention here as it is treated with the necessary amplification in all books of practice, but the fact that the purely syphilitic forms respond very reasonably to specific treatment should be kept in mind.

The cachexia of syphilis so reduces the general health that the patient is a prey to all forms of neuralgia, hysteria and neurasthenia, all of which are apt to be attended by considerable nervous depression. They do not differ from similar neuroses arising independently of syphilis, but do differ in the possibility of prompt relief.

That epileptic or epileptiform attacks attend many forms of syphilitic disease is well known and has been referred to in the earlier pages of this article, but, according to Fournier, there is a type peculiar to syphilis.

1. It is unsustained by any other evidence of cerebral disease.

2. It continues unchanged.

3. It is of long duration, lasting a life-time even.

4. It is not amenable to anti-syphilitic remedies.

5. The Bromides have little control over it.

6. It is abrupt in onset, usually in the form of a full epileptiform seizure without prodromata or exciting cause.

7. It often continues in the form of a petit mal, grand mal, or a varying association of both.

8. Attacks are commonly frequent during the first two or three years; after that at long intervals only.

It is stated on the authority of Julien that there are two additional diagnostic marks:

1. The patient is never actually unconscious, although he may be unable to move.

2. He never utters a cry.

Hereditary Parasyphilitic Diseases.—By as much as the primary disease is active in the parents, by so much is the probability, strong or weak, of the transmission of resulting diseases to their offspring. Transmission to the third generation is extremely rare.

Under this head are to be grouped the following: Juvenile tabes and paresis, deficient growth and vitality may often be traced to it, infantilism, mental defects, idiocy, hydrocephalus, cerebro-spinal agenesis in its various forms.

General Considerations.—Before we decide that a case is syphilitic we should ask ourselves:

1. What is its seat as indicated by the symptoms, and what is its nature, as shown by their course?

2. Is the process thus indicated one of those which may be syphilitic?

3. Has the patient had syphilis?

4. Can any other causes of the morbid process be traced?

5. Does the result of treatment confirm our conclusions? Remember always that although a person may have had syphilis the lesion may not be syphilitic.

Diagnosis.—True syphilitic lesions conform generally in two conditions to a standard :

1. Time needed to develop the symptoms.
2. Place of attack.

Time may be sudden, sub-acute or sub-chronic. A sudden onset is not rare, since the occlusion of an artery is a common accident.

An attack which is acute but not sudden means an inflammation whose onset is not typically specific, since it has been found that syphilitic lesions generally take a week to develop and are therefore sub-acute in point of time.

They seldom endure more than three months before they give localizing symptoms, hence they are sub-chronic.

Keeping these facts in mind, it is not difficult to perceive that a lesion of many months or a few days is not likely to be syphilitic.

Place, is generally outside of the actual nerve elements. The perineurium or other sustentacular structures of the nerves are the parts which are affected, and hence all functions of the nerves are affected. When a lesion involves only one function of a nerve it is not usually syphilitic.

Prognosis.—The general opinion that syphilis is incurable is fallacious. When proper treatment—constitutional, hygienic and medicinal—is advised and conscientiously followed, syphilis is one of the most curable of diseases; when neglected, a living, if not actual, death often results. If proper treatment is begun during the primary or early secondary period and observed for about three years in the male and four in the female, restored health and a system returned to a condition capable of doing its share in procreating perfectly healthy offspring may be expected in 97 per cent. of those afflicted with syphilis.

Treatment of a syphilitic infection should not be undertaken by the physician without the distinct understanding that the case will remain under care and observation for three years if a man and four if a woman. All, however, do not require this prolonged medication, many being cured in a much shorter period. Much depends upon the remedial agents administered during the first year. Some recover from syphilis without treatment and never manifest secondary or tertiary symptoms during their lifetime. The constitutional environments, habits and surroundings of the affected individual in a certain degree modify the results. It is said that individuals of light complexion and auburn hair suffer more than brunettes. The same may be said of those who fail to give themselves proper hygienic care, indulge to excess in tobacco or alcoholics, have chronic malaria, or are of a tubercular, rheumatic, gouty or neurotic diathesis.

The primary lesion or chancre may heal without treatment. Usually it exists for three to four weeks though the induration often remains until well into the second stage; sometimes it continues for years. The chancre, even when extensive, rarely leaves much of a scar, though a pigmentation or seeming whitening of the parts may remain for some time. The original lesion may become transformed into a mucous patch or infecting ulcer, which will disappear only after properly directed constitutional treatment has been instituted. If the primary lesion becomes phagedenic much destruction of tissue with deformity from cicatrization may follow. The severity of the constitutional symptoms bears no relation to the size of the original lesion or the associated lymphatic involvement, nor is the chancre governed, as to size, induration or character, by the manifestation presented by the infecting syphilitic. A short primary incubation, followed by early well-marked secondary or early tertiary conditions, indicates a virulent invasion, or an unusual

deficiency of the resisting power of the system to the disease, and severe manifestations may be expected. Of the constitutional symptoms, those appearing on the cutaneous and mucous surfaces are the earliest. Without treatment they are troublesome; with proper care and correct methods they quickly disappear. Lesions of the mucous membrane, particularly those occurring on parts supplied by the upper cervical portion of the sympathetic nervous system, are prone to recur, though many of the throat and mouth disorders are due to neglect of the toilet of the mouth and improper observance of general directions.

As syphilis has a rather definite stated duration and as many of the special manifestations may be trivial or severe, the disappearance of this or that particular set of symptoms in a few cases does not prove that the method of treatment employed is especially to be commended. Tertiary sequelæ conditions rarely appear when the treatment is well conducted, though it must be acknowledged that the so-called tertiary manifestations are sometimes the first to appear, constituting what is called malignant syphilis.

The later the period at which the syphilitic comes under scientific treatment, the less favorable is the prognosis; in other words, the longer the syphilitic cell over-growth is allowed to impinge upon the invaded tissues and diminish their functional activity or interfere with their nutrition and destroy their individual structure, before the specific material is removed, the less favorable the prognosis, particularly if the whole dependence is placed upon the traditional effect of Mercury, Potassium iodide, etc. This unfavorable prognosis can, however, be greatly discounted when medicines symptomatically indicated are employed to revive and regenerate the injured tissues. The early constitutional symptoms usually answer rapidly to medication, the later conditions slowly. This is especially true of lesions on the tongue and

in the viscera. The tertiary or sequelæ conditions, due to the destruction of normal tissue which cannot be reproduced, while amenable to treatment, are often unsatisfactory as to results. This is particularly true of lesions within the nerve mass. The earlier the so-called tertiary symptoms appear the more unfavorable the prognosis, as it signifies that the resistance of the system to the inroads of the disease is very slight and the vulnerability great.

That syphilis is better managed now than in the past, and that, consequently, the so-called tertiary manifestations are not common, is recognized by all, though it may, as is believed by Esmarch, be due to a more general acquired immunity, exemplified in those syphilitic infections which run their courses without treatment, the only symptoms being the original lesions and a possible transitory erythema.

Syphilis, under proper treatment, does not shorten life, though if neglected until the sequelæ period, fatal results may occur. Some authorities are of the opinion that syphilitic lesions may be transformed into cancerous conditions. This the author believes to be impossible, though one may complicate the other. From the point of life insurance, provided proper attention is observed during the three years following the chancre, the risk is not materially impaired, but it is undoubtedly augmented at a later period if the condition is neglected.

All primary and the early secondary lesions contain the infecting principle, but the late secondary and tertiary rarely. The normal physiological secretions are innocuous unless, contaminated by a discharge from some lesion in the continuity of the various structures of the body in which they come in contact. Justis' blood test is based on the asserted fact that a single inunction of mercury in untreated secondary, tertiary, and congenital syphilis causes a reduction in the hemoglobin—due to the sensitiveness of the red blood cells to the

action of the drug—while in non-syphilitics no reaction follows.

Marriage.—A male patient may be considered cured and be permitted to marry eighteen months after the disappearance of the last specific manifestation, provided three years have elapsed since the commencement of his infection, and treatment has been continuously followed. In the female, four years should elapse. The reason for this rigid rule is that parents sometimes transmit a syphilitic impression to their offspring long after they have lost the power to inoculate the general public. No deviation should be made from this rule, or the most dire results may follow to innocent parties. Some do, however, marry earlier without serious subsequent results. When properly treated there is no reason why all syphilitics should not at some time marry, but while primary or secondary manifestations are present no one with any sense of right or justice should entertain for one moment the thought of marriage.

Syphilis in Pregnancy.—A woman suffering from the early manifestations of syphilis usually, if not treated, aborts at about the third month. Each succeeding pregnancy may go a little longer, until finally an apparently healthy child is born; but after a short time it may become shriveled, old-mannish, without apparent cause, and finally die. Miscarriage in the syphilitic mother is usually due to gummatous deposits, general or circumscribed, in the placenta. If the mother infected by syphilis is placed under proper anti-syphilitic treatment, and it is continued during pregnancy, a healthy child may always be expected, except during the first pregnancy, when abortion almost always results, even if the proper treatment is instituted.

HEREDITARY SYPHILIS.

Congenital syphilis must not be confounded with the early

acquired form, which, while usually pursuing a virulent course, generally presents well-marked primary, constitutional and sequelæ or tertiary periods. The congenital form has no demonstrable primary stage, the secondary and tertiary manifestations appearing simultaneously or without regard to periodicity. Hereditary syphilis is identical with acquired syphilis in its constitutional effects.

Hereditary syphilis may descend to the offspring from the father (seminal transmission), the mother (ovarian transmission), from both, or by direct contagion through some break in the continuity of structure in the genital tract of either parent, allowing of inoculation of the germinal point at the time of conception. If a spermatozoa from a syphilitic father, not contaminated by some contagious discharge, be inoculated into a person virgin to syphilis, no infection will result, but if one of his spermatozoa impregnates an ovum, it will carry with it the syphilitic infection, the degree of virulence depending upon the period of constitutional syphilis of the man and the treatment he has observed. There are, however, many records of fathers with constitutional syphilis having healthy children born to their issue when not under treatment, as well as syphilitic offspring which were born many years after all evidence of syphilis had disappeared from the father.

Maternal descent is generally the result of syphilis contracted by the mother before impregnation, though it may be due to infection acquired up to the seventh month of pregnancy. The maternal impression is more pronounced than the paternal, and even under the best of treatment it is possible for it to impress the offspring for a far longer period after infection. When the mother contracts syphilis previous to the eighth month of gestation it is usually transmitted to the offspring ; after that period the fœtus generally escapes. When both parents are syphilitic at the time of

embryonic conception, the resulting being rarely escapes **infection**. The ovum, which at the moment of vitalization is impressed with a syphilitic mark, may be so blighted as to be destroyed and cast off by the uterus during gestation ; or, if not, may develop early or late hereditary manifestations, which may result in death, deformity or degeneration.

When the fœtus is discharged from the womb before the fifth month, often no diagnostic evidence of syphilis will occur. Generally, however, there are well-marked cutaneous lesions, deficiency of adipose tissue, visceral lesions, *e. g.*, hypertrophy of the liver and spleen, as well as hydrocephalic conditions and apoplectic effusions into the cerebral mass and its coverings, which are frequently wrongfully attributed to as tubercular disease. At the later periods of intra-uterine life, the characteristic epiphyseal-osteochondritis may be demonstrated.

While the changes may be entirely in the fœtal structure, abortion is often due to distinct placental changes, such as extravasation of blood into the placental structure, which by its mechanical presence detaches it from its uterine connection and destroys its usefulness, as well as the fatty and amyloid changes which reduce its functional activity and cause inanition or want of development of the fœtus.

At birth, the infant born to luetic parents may present the characteristic syphilitic imprints. It may have nothing unusual to mark its diseased condition. It may die within a few weeks, although sometimes death is postponed until between puberty and adolescence ; the condition is then called syphilis hereditaria tarda.

Infants born with hereditary syphilis are anæmic, weazened, shrivelled. At birth, or within a few weeks, numerous pemphigus bullæ with hyperæmic areolæ appear upon the soles of the feet and palms of the hands. A troublesome coryza is usually present, with specific erythema and redness

the nature of the disease must be carefully explained to the afflicted individual, as well as the contagious and infectious nature of the blood and secretions from the primary and secondary lesions, and proper methods advised for the protection of his immediate family, friends and the general public. The syphilitic should be encouraged and buoyed up with the hope that if proper treatment is observed a cure may follow, and the ill effects strongly portrayed if it is disregarded. Particularly must his mind be disabused of the fallacious opinion, often shared and promulgated by some of the medical profession, that lues is incurable.

The diet must be carefully regulated, so that the food eaten will not only be easy of digestion, but of such character that it will build up the system, which is soon to be subjected to the ravages of a chronic contagious disease. The greatest possible amount of easily assimilable nourishment must be ingested daily; that is, with but few exceptions, a good, liberal, general diet. If they are in a tubercular or depressed physical condition a diet rich in easily digested fats and carbo-hydrates should be recommended. Acids and sweets must be always prohibited during the periods when a mercurial treatment is being given, or when the mouth and tongue are involved in special local lesions. Sometimes a liquid diet only can be tolerated. Liquors of all kinds must, save in exceptional cases, be forbidden, not only on account of their primary ill effects, but on account of their remote impressions on the general nervous system, inducing late nervous manifestations. If the syphilitic is gouty or rheumatic, all sweets, wines and malted liquors must be interdicted, and dark meats rarely allowed; the natural lithia waters should be taken ad libitum.

Tobacco, constitutionally as well as locally, is very detrimental and must be disallowed at all times. When the tobacco habit is indulged, recurrent mouth lesions will be

very much in evidence, becoming not only annoying to the patient, but a great menace to those with whom he may associate.

The hours of sleep must be regulated, the bedroom well ventilated and maintained, if possible, at a temperature of about 65° Fahr. Carousing of all kinds should be forbidden, and, while proper general employment of time is commended, excessive mental application and nerve strain must be avoided. This is particularly true in those of a neurotic type, in whom worry often induces an unpleasant train of nervous and mental troubles. Golf, horseback rides and general outdoor recreation are beneficial. In fact, the general life should be so conducted as to insure a great abundance of fresh air. For this reason, outings, excursions and travel are to be recommended. Exposure to cold and dampness must be shunned, and due attention given to the wearing of clothes adapted to the individual requirements and the atmospheric conditions. Systematic massage is to be commended, and the daily rubbing of the skin with a flesh brush or the hand will be beneficial. The teeth should be placed in good condition before the advent of the secondary symptoms; they should be regularly and properly brushed, and the mouth kept clean.

Prepared salt water, sea water or sulphur baths, sponge and general, should be taken regularly. The free use of water, both internally and externally, is to be advocated. Externally it stimulates the eliminative action of the skin, and in a varying degree prevents local manifestations, it also inhibits or diminishes the liability of the afflicted individual to contract colds. Internally it not only assists the system in eliminating the products of retrograde metamorphosis and the excess of mercury and the iodides, but it hastens the resolution of syphilitic neoplasms.

From one to three tub or Turkish baths a week, provided they do not debilitate or make the sleep unrefreshing, should

be advised during the entire course of treatment. The efficacy of the baths can be greatly increased and tissue metamorphosis and elimination of the specific morbid principle facilitated by drinking freely of hot water. Baths are particularly useful and necessary during the early constitutional period.

The Hot Springs of Arkansas have gained a national reputation as a cure for syphilis. In some respects this celebrity has been harmful, particularly as the general public has been, by many unscrupulous local physicians, induced to believe that a course of six weeks at the Hot Springs baths will cure syphilis. There is no doubt that all external manifestations of the disease may disappear in that time. The same thing can be accomplished at home under similar environments, *i. e.*, freedom from cares and business, baths, good food and the limit of anti-specific medication, but the fact remains that a six weeks' course of treatment at the Springs does not cure syphilis nor lessen the period of time necessary for its obliteration. The Hot Springs is not the Mecca of the incurable syphilitic unless the bathing is accompanied with proper medication, and for a sufficient interval of time.

The assurance sometimes given that with the disappearance of the external manifestations a cure has been accomplished has undoubtedly done more harm to those afflicted with syphilis than the good the Springs have ever accomplished. The hot baths at the Springs of 98° Fahr., however, seem to give the same results as the artificial hot bath at 110° at home; both permit a vigorous anti-syphilitic treatment to be given with a consequent rapid relief of the local lesions. Often a visit to the Hot Springs appears advisable, *i. e.*, to those who can afford a therapeutic luxury, or when the general system requires a change of air and surroundings to awaken the slumbering energies and cause the action of the prescribed anti-specific medication to be intensified; where a

warm climate in addition to the baths seems necessary to increase the toleration of the mercury administered, or where the patient wishes to absent himself from the gaze of his friends and family until the disfiguring lesions can be eradicated.

All hygienic methods which tend to maintain the emunctory systems—kidneys, gastro-intestinal tract and skin—in the best possible condition should be advised, in order that the body may be able to repulse the inroads of the invading disease. The hygienic routine must not, however, be made so irksome that the patient will rebel and refuse to continue. Hereditary tendencies must be investigated and their influence counteracted.

The syphilitic must be informed that not only the original chancre, but all the other specific lesions, with their discharges and secretions, as well as the blood or any normal secretion which is in any manner contaminated, are loaded with the syphilitic contagion and capable of causing infection if at any time they come in contact with the abraded surface of one not immune. Hence, cups, glasses, cutlery, razors, combs, brushes, towels, soap, etc., used must be properly looked after to prevent infection of the inoculating one.

Constitutional and Specific Treatment.—During the so-called primary or initial stage mercury is rarely indicated, and when administered it is often extremely detrimental to the patient's future, though some are of the opinion that when a chancre appears on the lip or finger, its great menace to society at large demands its suppression at the earliest possible moment and at any cost. *Corallium rubrum*, *Hepar sulph.*, *Echinacea* and *Phytolacca* administered according to the symptomatic indications often materially hasten the healing of the chancre.

When the constitutional manifestations appear, mercury is symptomatically indicated. The reason why mercury in its

various forms has acted so universally satisfactorily when given in appropriate doses and continued for a period approximating the constitutional period of the disease is not because it is antidotal to the syphilitic poison, but because it is homœopathic to the general syphilitic condition. That it is in no way an antidote to syphilis, even when given in quantities sufficient to produce pronounced physiological effects, is proven by the fact that often when it is discontinued the disease again shows itself in various unmistakable manifestations. A careful study of the physiological and symptomatic provings of mercury are conclusive arguments as to how and why it is so nearly a universal remedy. To give its special indications would be to give a history of the entire constitutional period of syphilis. It prevents rapid proliferation and obstructive cell formation induced by the specific toxines, and when these are present hastens fatty degeneration and elimination of the foreign and obstructing material.

Other remedies are often helpful, particularly when constitutional manifestations appear or there are individual idiosyncrasies. These must always receive proper consideration; they should never be overlooked.

In the treatment of syphilis, some prefer to administer this curative substance by the ingestive method and in various doses, others advocate the endermic process, by inunctions or fumigations, while others prefer the hypodermatic mode.

From the pathogenesis and symptomatology of mercury the best of results may be expected and realized from its scientific administration. Much of the future as well as the immediate health of the syphilitic depends upon the proper adjustment of the dose, and the selection of the appropriate preparation to the period and conditions presented. It is universally used, but the dose and mode of administration, advised by individual members of the medical profession vary

greatly. Hahnemann says mercury is the specific remedy for syphilis. Yeldham advises *Mercurius solubilis* 1x or 2x, in five-grain doses; also the Protoiodide or Biniiodide 2x or 3x trituration. Jahr recommends *Mercurius solubilis Hahnemannii*, *Mercurius præcipit. ruber*, or *Cinnabaris*, in one-half grain doses of the second trituration. Calomel is efficacious particularly in iritis or where it is advisable to place the patient immediately under the influence of mercury; it should be given in one-tenth grain doses at frequent intervals. Baehr prefers *Mercurius* in the 3x trituration; Jousset, *Mercurius corrosivus*.

Mercurius protoiodide is useful in what may be called the quiescent period, one tablet of the first decimal trituration being administered before meals and at bedtime. Many physicians who have good results in the treatment of syphilis depend almost exclusively upon the Protoiodide of mercury, following to a varying degree the Keyes' tonic or continuous treatment, a modification of the Fournier method, which is as follows: A one-sixth grain granule of the Protoiodide of mercury is selected as the original dose, one granule is administered after each meal for three days; on the fourth day the mid-day dose is increased to four granules; on the seventh day the morning dose is increased to two, a granule being added to the daily amount every third day until there is positive evidence of the physiological action of the drug manifested by intestinal irritation, colicky pains and diarrhœa, or the gums become affected. This dose is known as the full dose, and if long continued may be detrimental. It may, however, with the use of opiates and an unstimulating diet, be continued until the syphilides abate. When this occurs, the dose is reduced one-half it is known as the tonic dose and is continued indefinitely unless symptoms appear, when the full dose may be again resumed. In the later stages of the active constitutional period, Biniiodide of mercury, one-

fiftieth of a grain, three times a day, is often useful. When periosteal manifestations appear or rapid effects are necessary in brain lesions, hypodermic injections of the Bichloride, one-thirtieth to one-twelfth of a grain in sterile water, every third day, give excellent results. Hypodermics of Calomel have been unsatisfactory on account of their bad local effects and salivation. If mercury is given judiciously, it is often the only remedy required to effect a cure; when given injudiciously it is generally productive of much harm.

The mercurials most frequently indicated in the early period of the secondary stage are *Mercurius solubilis* Hahnemannii, *Mercurius vivus* or *Mercurius protoiodide*; in the late secondary and tertiary syphilis, while the former are useful, *Mercurius biniodide* and *Mercurius bichloride*, *Cinnabaris* and *Mercurius dulcis* will be more frequently indicated.

Mercurial Inunctions.—Cutaneous and mucous lesions yield rapidly to this method of treatment; the erythema and papular manifestations disappear rapidly and gratifying results follow. The inunction treatment consists in applying and rubbing into the skin metallic mercury or some of its preparations mixed or suspended in a fatty vehicle. It is the oldest known method of syphilitic treatment. In recent years it has become again popular and is giving the most satisfactory results. The stomatitis, etc., which formerly followed this method of treatment and that for a time seemed to contraindicate its use was due entirely to the imperfect methods of application. The most satisfactory preparation of mercury to use is the officinal 50 per cent. Mercurial or Blue ointment, *Unguentum hydrargyri*, though sometimes the mild (25 to 30 per cent.) may be required. It is of the utmost importance that this ointment be freshly prepared, as a rancid preparation may be ineffective or irritate the skin. Fraser's preparation,

℞ Mercury,	℥ viij.
Lanolin,	℥ ijss.
Lard,	℥ vss.
Comp. tinct. benzoin,	m. clx.
Alcohol,	m. lxxx.

which is readily absorbed by the skin, is compounded as follows :

The mercury is triturated with the alcohol until coarsely subdivided, then the other ingredients are gradually added until a thorough mixture is obtained. The ointment is encased without heating in soft gelatine capsules containing either thirty or sixty grains. Some substitute a 20 to 30 per cent. Oleate of mercury, which, while it may soil the skin less, is more likely to induce various forms of dermatitis. Soap containing 50 per cent. of mercury has been employed, applied as a lather and well rubbed in, as well as Mercurial plasters and linen impregnated with metallic mercury.

The amount of Mercurial ointment for each inunction must be adapted to the individual; the strong, robust, of average weight, particularly if they live an outdoor life and are largely free from the cares and vexations of business life, will do best with the ordinary dose of sixty grains. If they are thin, and spare, with weakly constitutions and perhaps flabby conditions of the muscles, thirty grains may be sufficient. During the first two weeks of this variety of medication a careful physical examination of the patient must be made every second or third day, and if symptoms of an untoward nature appear which cannot be alleviated, the inunctions must be discontinued. It particularly happens in those having a tubercular diathesis or special idiosyncrasy. With the vast majority the greatest benefit results from their continued use for a long period. The effect of the inunctions is noticed in the disappearance of the cutaneous and mouth lesions, increased weight, improved appetite, regular action of the bowels, refreshing sleep, etc. When during mercurial treat-

ment, dermatitis, stomatitis, intestinal disturbances, loss of weight and strength, congestion of the head, lungs or heart, fever and perspiration, pain in bones and joints or great sleeplessness develop, the mercury must be discontinued. Occasionally the treatment of syphilis must be conducted entirely without the assistance of mercury. To obtain the best results with the inunctions, the indicated symptomatic remedies must be prescribed for the general condition.

During the period in which the inunctions are used, the skin must receive the greatest care. At the baths or water cures, the inunction is best given after the bath in the morning. After proper repose moderate exercise may be indulged in. In the home treatment the inunctions should be given at night, preceded, if possible, by a bath at a temperature of 96° to 98° Fahr., and a thorough rubbing and drying of the surface with a towel. If the general bath is impossible the skin of the parts to be anointed must be cleansed with hot water and soap, douched with clean water and followed by a 2 to 3 per cent. aqueous solution of Carbolic acid or Alcohol; careful asepsis must be observed or subsequent unpleasant dermatitis may follow. In order to apply the inunctions systematically it is well to divide the body into six parts and to anoint one part each successive day until the entire body has been covered. On the seventh day it is generally advisable to omit the inunction and take a general warm tub or Turkish bath. On the eighth day the inunctions should be begun and repeated as before. The divisions of the body are as follows: (1) chest and abdomen; (2) back; (3) right arm, axilla and palm; (4) left arm, axilla and palm; (5) right leg, groin and foot; (6) left leg, groin and foot. When applications to the scalp, face or neck are necessary, a small quantity of the following ointment may be substituted:

℞ White precipitate, grs. xxx.
Cold cream, ʒ j.

The parts being properly prepared the requisite amount of the selected preparation can be applied by the patient or nurse, in small portions and rubbed in thoroughly with the palms of the hands. Each inunction will require from twenty to thirty minutes' manipulation of the parts. On the chest, abdomen and back, the ointment will largely disappear in twenty minutes, but the extremities at the expiration of the twenty minutes will have a pot-leaded appearance. There is no danger to the non-syphilitic in applying the ointment provided the hands are free from cuts or scratches and are thoroughly anointed with Olive oil, simple cerate or soap before beginning the application. After the inunction a thin gauze shirt or drawers, as indicated, should be put on to protect the linen, then the night clothes, and after drinking a pint or more of hot milk, or tea, to induce sweating, the patient should go to bed. From thirty to one hundred of these inunctions can be given with the best of results during the first six to twelve months of the disease, particularly when local manifestations are present. When the inunction treatment is employed few or no symptoms ever occur after the erythematous syphilides. Mercurial inunctions are generally advisable only when active syphilitic lesions are present. When administering the inunctions it is advisable, to forestall or prevent stomatitis, to daily wash the mouth with a weak solution of Potassium chlorate or brandy and water. When for any reason the inunctions cannot be used, the first decimal trituration of *Mercurius solubilis Hahnemannii* may be substituted as the nearest similitum.

Fumigation has its advocates; its sphere is for emergencies only and not for continuous treatment. Twenty to forty grains of Calomel are placed over the fusing lamp (Fig. 171), or a combination of fifteen grains of Calomel and twenty grains of Cinnabaris may be employed; the quantity being diminished or increased as the specific lesions may require.

The selected mercurial preparation is placed in the cup and about four ounces of water poured into the groove which surrounds it; the patient then sits on a chair, covered only with a blanket or mackintosh and the lamp is lighted. The heat and steam soon induce free perspiration, and the mercury is deposited upon the surface of the body. Sometimes the fumes well mixed with air are inhaled. When fumigation is complete the patient should retire and cool off slowly and

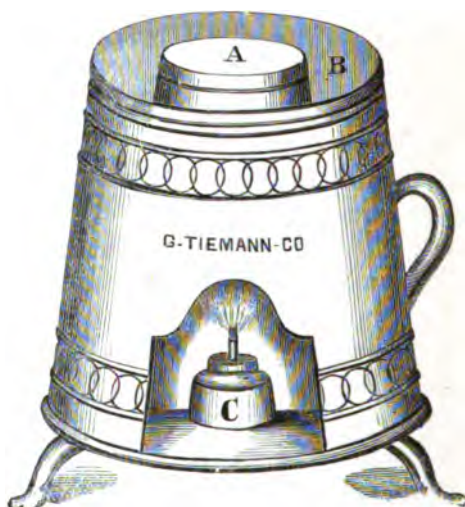


FIG. 171.—Lees Lamp for Mercurial Fumigation.

remain in bed for some time. These fumigations are best taken at bedtime, but never immediately after a meal; if the treatment causes fatigue or debility the quantity of mercury must be reduced or that mode of treatment discontinued. Fumigation must not be administered daily; every second or third day usually gives the most satisfactory results, but it should never be continued more than one or two months.

Hypodermatic Treatment.—This is claimed by its advocates to be the most efficacious, accurate, simple, and satis-

factory method for the administration of mercury in constitutional syphilis. Its most obvious advantage is the accuracy of dosage. Whether a soluble salt, which is shortly absorbed into the circulation, or an insoluble one, that is more slowly changed and dissolved, is employed, within a certain time depending on the preparation, the entire medication administered always reaches the circulation. There is no uncertainty or indefiniteness about it. This is true when the drug is deposited in the muscle tissue in the usual way. All admit that it is the method par excellence when syphilis attacks the brain or the eye, when late dermal and other lesions are obstinate and relapse repeatedly, when tabes or general paralysis of suspected luetic origin is to be treated, or when a rapid differentiation between a carcinoma and a gumma, for instance, is to be made. No other method of treatment so quickly causes the disappearance of the ordinary symptoms of the luetic disease, and none so effectively prevents their future event.

The hypodermatic method is cleanly, and if given with ordinary antiseptic precautions it is absolutely safe. Inflammatory indurations are very rare; and when they occur they are small and not troublesome, merely delaying the absorption of the medicant; they subside spontaneously. There is practically no pain at the time of making the injection, and subsequently, for a day or two, no more than a slight discomfort when sitting on the injected side. The objections to this form of treatment are the occasional occurrence of infiltration, abscesses, and fat embolism of the lungs.

Both the soluble and the insoluble mercurial salts are employed for the hypodermatic treatment of constitutional syphilis; each has its advantages and its advocates. The soluble salt most often employed is the Corrosive chloride; the other combinations, such as the Albuminates, Oxycyanide, Benzoate, Formamid, etc., have not gained any very general acceptance.

Corrosive sublimate, one part; Glycerine, sixty parts; Distilled water, sixty parts, is a convenient concentration. This allows of easy regulation of the dosage. Ten minims (0.6 c. c.) containing one-twenty-fourth of a grain (0.0025 gram.) is the usual dose.

There are some objections to the use of the soluble salts. The injections are necessarily more or less painful. Then, since the absorption takes place very quickly, they have to be given daily, and but few patients will agree to this. An ordinary course consists of from twenty to thirty injections.

The insoluble salts are the agents of election in 99 per cent. of all cases of constitutional syphilis. Calomel is the one that has perhaps been most extensively used. The Tannate, Yellow oxide, etc., have been used to some extent. The neutral Salicylate of mercury is now quite generally used. It contains somewhat less of the metal than Calomel and must be used in slightly larger doses. It seems to be the safest, most effective, and most convenient of the insoluble salts. It is employed in an oily menstruum. The formula is as follows: Neutral mercury salicylate, one part; Liquid albolene, ten parts. It must be thoroughly sterilized by heat before using.

The Gottheil hypodermic syringe has proved very satisfactory. It is simple, readily cleansible and sterilizable, and all the injection fluid is entirely visible: it is small enough for accurate dosage in minims or fractions of a drop, and the metallic parts are sufficiently heavy to facilitate rapidity of needle introduction, which, as will be seen later, is an important part of the technique of painless medication.

The needle should be of large calibre and long enough—about an inch and a half in length—to reach well down into the depths of the muscular tissues into which the injections are to be made. It is well to keep a separate needle for each patient. Rapid passage through an alcohol flame, so that the temper is not spoiled, is all that is required before making the puncture.

The sterile Salicylate of mercury in suspension is well shaken, and the syringe and needle filled with it to the exclusion of all air-bubbles. The presence of a little air does no harm, however, if care is taken to make the injection with the proximal end of the syringe slightly elevated, so that any air present may rise to the piston.

The selected site is preferably the buttocks. A point high up and well toward the intergluteal fold is the best; the patient suffers no inconvenience in sitting after the injection, and there is but slight pressure on it even when recumbent. The injection site before the introduction of the needle is rapidly cleansed with hot water and green soap and then with Ether. This latter should be used freely, for the refrigeration that it effects is sufficient to temporarily anæsthetize the skin, so that the needle prick is hardly noticeable. The insertion is then made quickly, the needle being plunged straight through the skin and up to the hilt into the gluteal muscles. After the needle has been inserted the syringe is detached from it and the orifice of the needle's lumen watched for ten to fifteen seconds. If the oil drop bulges or runs out of the needle, and especially if it is followed by a little blood, it shows that the point of the needle has engaged in the lumen of a vein; it must at once be withdrawn and another puncture made. Traversing the vein, as must inevitably occur occasionally, does no harm. A little oozing of blood after the injection is completed, which is evidence of this, is of no consequence. The site being found safe, the syringe is reapplied to the needle and the injection slowly completed. The instrument is then rapidly withdrawn from the tissues and the puncture immediately closed with a small piece of sterile Zinc oxide plaster.

Injections are given alternately in the two buttocks. This allows, on an average, an interval of one month before the same side is used again, a period that is more than sufficient,

since all traces of the injection usually disappear in ten days at the most.

The amount injected at one time varies with the age, the weight of the patient and the symptomatic necessities of the case. Three to ten drops (0.2 to 0.6 c. c.) is the usual dose, thus making from three-tenths to one grain (0.2 to 0.6 gram.) of the Mercury salicylate the usual amount. Young and old people and those showing mild symptoms or none at all get the smaller doses; middle aged individuals and those with obstinate or serious lesions get the larger amount.

From ten to fifteen injections are administered at intervals of two weeks, and then a non-mercurial interval of from four to six weeks is allowed. Then a second similar course is instituted, to be followed by a similar interval. This usually brings the treatment to the end of the first year. Two or three courses with the intervals of the same kind will be needed in the second year and one or more in the third.

No preparation of mercury must be prescribed only upon the stage or time that has elapsed since the chancre, and the same may be said of Kali iodide, Aurum, Graphites, etc., for the tertiary symptoms are not always the late symptoms and the secondary are not always the early ones, though those syphilitics who have been conscientiously and carefully treated with a mercurial preparation are rarely affected with tertiary manifestations. Great attention should be paid to the idiosyncrasies of the patient. The general plans so often commended to treat all alike seems to the author to be unscientific and harmful. Each case must be individualized and treated accordingly.

Mercurial Poisoning and Its Treatment.—When mental depression, ptialism and other symptoms of poisoning appear during the administration of mercury it must be stopped and appropriate treatment instituted. This condition may be due to over-dosage, the ingestion of sweets or acids, individual

idiosyncrasy and faulty action of some of the excretory organs. The latter is most generally the cause, the proper consideration of which would, in the majority, prevent this unpleasant occurrence. Mercury is chiefly eliminated through the bowels, consequently they must receive proper attention and constipation never permitted to exist while the drug is being administered. If this cannot be accomplished with the indicated remedy, *Cascara comp.*, a tablet, once or twice daily, as required, or some saline water, such as *Hunyadi* or *Rubinat*, must be administered. The skin eliminates mercury in a small degree, hence it must be stimulated and sweating encouraged by frequent cleansing and hot or Turkish baths and ingestion of large quantities of pure spring water or mineral water, which also increase the flow of urine.

Ptyalism.—This is undoubtedly the most frequent and serious condition which follows the injudicious administration of mercury. Whenever mercury is being administered and there appears an increase in the salivary secretion, a bluish line on the margin of the gums, a copperish taste in the mouth, or the teeth feel too long, it must be discontinued at once or a most intense stomatitis with all its distressing clinical symptoms, profuse salivation, increase in the size of the tongue, swelling and ulceration of the tissues of the mouth and gums, excessive fetor of the breath, etc., will occur. Not only should all mercurial medication be stopped, but steps should be taken to increase the emunctory functions of the intestinal tract, skin and kidneys. Mercury is best antidoted by Chlorate of potash, in five to ten grain doses every three hours. After improvement begins and elimination is well established, Potassium iodide in appreciable doses will liberate the mercury stored in the system and facilitate its removal. A mouth wash composed of

℞ Potass chloridi,	3 ij.
Myrrh.,	3 iijss.
Glycerini,	3 ss.

will facilitate healing of the mouth. Relief of the local lesions may be facilitated by the daily application of a 10 per cent. solution of Nitrate of silver. Belladonna or Hepar sulphur are generally useful for the general symptoms. A bland liquid diet is often necessary for a number of days. Mental and emotional impressions usually yield quickly to Coca wine, a small wine glass, three or four times a day. Pains in the hands and soles of the feet are characteristic of over-mercurialism, and are relieved by discontinuing the drug.

The Iodides of Potassium, Sodium, Etc., have won laurels in traditional medicine as alternatives; their power, when given in appreciable doses, to remove gummatous growths and to incite the healing of chronic specific ulcerations is established. While they may remove the unnatural growths which have invaded the tissues, materially injuring their continuity and functional capacity, the symptomatically indicated remedy must be employed to restore the parts to their former usefulness. The result of the indicated remedy varies according to the ratio or rapidity with which the foreign material has been removed and the accuracy with which the remedy is selected. Chief among these constitutional drugs are Graphites, Aurum metallicum, Sulphur, the Calcareas, the Kalis, Fluoric, Nitric and Sulphuric acids, Lachesis and the nosodes.

Practically all agree that the best results are obtained with Potassium iodide when it is administered in appreciable and gradually increasing doses. It is generally given in a saturated solution, each minim of the solution corresponding to one grain of the drug. The active element is the Iodine which is liberated in the system. Often owing to gastrointestinal irritations which Potassium iodide excites, Sodium iodide or the Iodide of starch must be substituted, the latter while less irritating is also less effective. The iodides should be given in milk, cold tea, a wine glass of Maltine

and Wine of Pepsin or Elixir Lactopeptine, after meals. The dose varies according to individuality and the requirements. Usually five minims (ten drops) of the saturated solution are first given three times a day, and subsequently increased two drops per day until the point of tolerance is reached or the symptoms yield, when the dose may be continued or somewhat reduced. In deep-seated ulceration of the throat, gummatous involvement of the bones; lesions of the brain and nervous system, viscera and testicles, enormous doses are often necessary, and may be continued for a considerable period. From two to five hundred grains per day are often required, though the usual amount is from fifteen to forty drops. When large doses are requisite and the stomach is irritated thereby, the drug will be better tolerated if it is followed by a copious draught of dilute starch water. While the Iodides are particularly indicated in late syphilitic lesions they are often indispensable in the constitutional period to combat malignant syphilis and some obstinate secondary lesions.

Sometimes in the later period of the secondary stage, what is known as the mixed treatment is frequently, with gratifying results, administered; it consists of a combination of mercury and Iodide of potash. The following are good examples:

Compressed tablets:

℞ Potassii iodidi, gr. v.
Hydrarg. chlor. corr., gr. 1-30.
Syr. sarsap. comp., m. xxx.

Ft. Tablet x.

Sig. One after each meal; increase dose according to requirements of case.

or in liquid form,

℞ Hydrarg. chlor. corr., gr. iv.
Ammon. iodidi, ʒ iij.
Potassii iodidi, ʒ j ʒ j.
Tinct. cinchonæ comp., ʒ iv.

M. Sig. One drachm in a wine glass of water after each meal.

or,

℞ Hydrarg. biniodidi,	gr. iij.
Potassii iodidi,	ʒ iij-v.
Syr. sarsapar. comp.,	ʒ j.
Aquæ,	ʒ viij.

M. Sig. A teaspoonful in a wine glass of water after meals.

Others use the Bin-iodide or the Protoiodide of Mercury in various potencies before meals, and the appropriate quantity of the Iodide of potash after meals, with occasionally a series of mercurial inunctions in neglected and untreated cases. Hughes says: "Nothing will take the place of Iodide of potash in the tertiary lesions of syphilis." Farrington says: "This remedy acts on the fibrinous and connective and ultimately the nerve tissues. The tendency of this drug is to produce infiltration, so when thoroughly indicated there will be œdematous or infiltrated condition of the parts." This remedy is indicated in nearly all of the late secondary and tertiary manifestations. When gummatous infiltrations involve the nervous system, the bones, etc., it is the first remedy to be thought of.

Iodinism. — The iodides like the mercurials sometimes produce unpleasant and unsatisfactory effects, and, therefore, when first exhibited, require very careful supervision. The bad effects of the iodides may be due to the iodine which they give up, liberating the mercury in the system which induces salivation, discharges from the mucous membranes of the nose, etc., though they also act to a considerable degree upon the salivary glands and may induce ptyalism. Those who are over-sensitive to the action of the drugs may suffer from general depression and uneasiness, nervousness, ringing in the ears, neuralgic pains in the bones and muscles, and perverted function of the mucous membranes, producing conjunctivitis, slight or severe inflammatory coryza, violent diarrhœa, griping pains in the abdomen, nausea,

vomiting, etc. Sometimes this can be overcome by changing from the potassium to the sodium salt, limiting the diet to rice and milk, and administering good-sized doses of Sub-nitrate of bismuth. In others by the daily ingestion of large quantities of a Lithia or any other good spring water, the eliminative functions can be increased, the unpleasant symptoms removed and the iodide continued. During the administration of the iodides, the skin and kidneys must be kept in perfect functional activity or iodine poisoning will surely occur. Many, while escaping true iodism, suffer from an eruption upon the skin which varies from an acne or erythema to a true purpura. Fatal cases of iodine poisoning have been reported. In some individuals a one-tenth grain dose, two or three times daily, will produce in a short time very unpleasant symptoms, compelling the discontinuance of the treatment.

Traditional medicine has a few other antisyphilitic remedies deserving of mention. Potassium chlorate, five grains thoroughly dissolved in water, taken three times a day for two or three weeks, is very useful in obstinate mouth lesions, the mercury being discontinued during this interval. The good results obtained are due probably to the Potassium salt antidoting the excess of mercury in the system. Cod liver oil in its various preparations is particularly useful as a tonic and fat producer. Iron has always been useful in the anæmic conditions so often present during both the constitutional and tertiary periods. A favorite alternative is the following :

℞ Protoclchloride of iron,	gr. 1-8
Bichloride of mercury,	gr. 1-128.
Chloride of arsenic,	gr. 1-280.

combined with Calisaya, alkaloids and aromatics. Henry's three chlorides are also of benefit in anæmia due to syphilis. Barclay's Mercauro has many reported cures and in certain syphilitic cachexias acts better than Aurum. Chloride of

ammonia, owing to its power to dissolve new connective tissue, has often been prescribed, particularly in nerve lesions. Sometimes, when Iodide of potash cannot be tolerated, Iodoform may be advantageously substituted. When the mental depression so common in this disease is pronounced, Coca, either as a fluid extract or wine, may often be taken to advantage.

Therapeutics of Nervous Diseases due to Syphilis.*—In considering this subject we should never lose sight of the fact that syphilitic changes are very different in etiology and localization from those termed para-syphilitic.

Syphilitic diseases are inflammatory, marked by new growth, and do not affect nerve fibres nor cells except by implication and contiguity.

Para-syphilitic are non-inflammatory; they are degenerations, *i. e.*, the result of the action of an intoxicant upon nerve cells and fibres.

Both these divisions, syphilitic and para-syphilitic, are marked by a peculiar tendency to remission and subsequent exacerbation, whether treated or untreated, and hence deductions as to the value of medication should be made with extreme caution, and then only when based upon data gained from the history of a large number of well authenticated cases.

The medicinal treatment of the syphilitic cases should be upon the lines laid down in the general division of this book. The hygienic and adjuvant measures are numerous and valuable, and should not be neglected in cases arising from this cause any more than from the ordinary injuries and infections which produce nervous diseases. In the cerebritis we have the same need for applications of cold to the head, the scalp being previously shaven, and the indicated remedies which will generally be Arnica, Belladonna, Stramonium, Hyoscyamus, Cannabis Indica, Cicuta, Coccus, Cuprum, Arsenic—at times, Bryonia and Hepar sulphur.

*Contributed by Dr. John E. Wilson.

In the spinal inflammation, Oxalic acid, Carbo animalis, Zinc, Plumbum, Actea racemosa.

If the bones are involved, Fluoric acid, Calcareo fluorica. Staphisagria, Stillingia, Carbo animalis, whenever there is a pronounced constitutional state expressed by exostoses, often combined with glandular irritations. Mercurius, in some form, as a general remedy, although the bones are usually affected in cases calling for this remedy. Badiaga, Mezereum, Natrum sulph. in general neuralgic pains. Cinnabar, where the pain is mostly supra-orbital. Aurum, for pains with the peculiar mental condition of hopelessness.

If a patient suffers only from peripheral nervous diseases, we should, as in other conditions of this kind, insist upon complete rest, preservation of warmth by suitable covering, applications of heated cloths when pain is extreme, and the use of the constant current of electricity, using the positive pole to the affected parts, although faradic stroking will often give relief. In the later stages of peripheral troubles after the violence of the attack has passed, warm baths, and the interrupted galvanic current will do much to restore function to paralyzed muscles.

Where the nerve cells have sustained damage, our means are more limited, but may be efficacious if the remedies are rightly chosen. I should feel that Plumbum, Oxalic acid, Zinc and Carbon bisulphide would give a promise of benefit in cases which are classically placed among the incurable degenerations. There is no class of nervous patients who may display such wonderful recoveries as the nervous syphilitic. If the lesions are due to a primary intoxication, upon the merest suspicion of a syphilitic causation, a thorough anti-syphilitic treatment should be inaugurated.

While we may view the future of the syphilitic with hope, we must modify our transports when we approach the para-syphilitic cases. These diseases are much slower in onset,

less marked by remissions, and immeasurably more tardy in amelioration, if such an issue ensues. If seen early we have to deal with an intoxicant; if later, with nerve elements dying or dead. These never are replaced, and their former site is occupied by a proliferation of the neuroglia, which is practically scar tissue. Syphilitic remedies are here evidently out of place, for we are dealing with a something elaborated from the syphilitic virus as a secondary and late-acting poison, or with the toxins of associated micro-organisms. In the earlier of these two conditions, symptomatological prescribing ought to find its especial field, and clinical results have given us some grounds for congratulation.

In order that this self-satisfaction should show a reasonable and healthy increase, we should select our remedies with a very high regard for their pathological appositeness to the diseased conditions. If we restrict ourselves to such drugs, and from those select according to the varying symptoms, we may be able to accomplish something unusual for the relief of our patients. Whichever of these remedies may be selected, it should be used for a long period without change. Remissions should not be considered as cures, but the natural history of the disease would always be kept in mind, for it is well known that they at times seem to spontaneously come to a state of stasis. Cognizant of the history of these cases, and conservative in our prognosis, we may, by wise management and skillful prescriptions, keep our patient in relative comfort, and at times have a ground for belief that we cared for him intelligently, that he by some combination of forces was restored to health, and that in that restoration we participated more or less prominently.

The definite conclusions which have long ago been reached concerning the nervous lesions of syphilis preclude the possibility of any great degree of originality in the preparation, of such an article as the foregoing; therefore, the writer of

the section on syphilis of the brain and nervous system wishes, among the many authorities consulted, to acknowledge especial obligation to the investigations and conclusions of Starr, Dana, Gowers, Church, Hyde, Bullock, Bartlett, McCarthy and Buzzard.

Acid, Fluoric.—Acts especially upon the bones and skin caries of the bones, pains worse at night, burning and intermittent in character; tubercles on the forehead and face; ulcerating squamous eruptions on the body; mucous tubercles; tertiary affections of the tongue; all discharges thin, acrid and excoriating.

Acid, Nitric.—Phagedenic ulceration on the tibia, etc.; ulcers with irregular edges, exuberant vegetations bleed easily; copper-colored blotches on the skin; secondary syphilides, especially on the face; suppurating pustules on the face with broad red areola or covered with crusts; squamous eruptions like psoriasis; cracks and fissures around the commissures of the lips; fetid odor of the breath; mucous patches covered with well-marked white deposit; ulceration of the nostrils and throat with discharge; ulcers and gummata of the mouth, uvula, pharynx and fauces; soreness of the tongue and its edges; ulceration of the rectum, with constipation.

Arsenicum.—Syphilitic cachexia; emaciation; debility, restlessness, anguish, excessive sensitiveness, general thinning of the hair, skin livid, with scaly eruption; tuberculous syphilides; malignant ulcerations; corrosive discharge with tendency to gangrenous destruction; fetid, exhausting, bloody diarrhoea with constant urging; evidence of serious intestinal disease.

Arsenicum iod.—Syphilitic consumption.

Asafetida.—Tertiary syphilitic lesions of the long bones; gummatous deposits; jerking, drawing pains in the limbs, worse at night; ulceration of the skin with a thin, fetid, ichororous discharge; sensitive to touch.

Aurum.—Cachexia, depression with great mental weakness, despair and prostration; periostitis of the cranial and long bones; caries of the bones of the mouth and nose; soreness in the nose with swelling and loss of smell; putrid discharge from the nose; ulcers on the tongue; alopecia, pain in the bones worse at night; syphilitic orchitis.

Carbo animalis.—Emaciation; periostitis; red, copper-colored blotches on the skin, especially in the face; tubercles in the skin; gummata; glands in various parts of the body enlarged and indurated; venous circulation sluggish, hands and feet blue and cold; gangrene.

Carbo vegetabilis.—Specific cachexia, great debility and emaciation; copper-colored spots on the skin; tertiary syphilides; specific ulcerations of the skin, with thin, acrid and offensive discharge; gangrene; cold sweat, cold breath, collapse; ulcerations having cadaverous odor; lymphatic glands swollen, digestive organs impaired; skin of a yellow hue with shooting pains through the liver and spleen.

Cinnabaris.—Syphilitic catarrh, pressure at the root of the nose, feeling as though something was pressing on the nose; throat swollen, tonsils enlarged, red and congested; chronic mucous patches on the mucous membrane of the mouth; small ulcers on the roof of the mouth and tip of the tongue; dryness of the throat and nose worse at night and on awakening; secondary syphilides of the mucous membrane.

Corallium rub.—Coral-red spots on various parts of the body, especially on the palms of the hands, finally changing to a copper color; specific erosions, ichorous, exuding a thin, badly smelling discharge.

Graphites.—Indolent ulceration; specific psoriasis; chronic skin diseases; glandular swelling.

Hepar sulphur.—Great nervous weakness, alopecia, painful swelling of the scalp; pains in the bones of the head, worse at night and from pressure, with red and inflamed eyes;

tonsils swollen and hard with enlargement of glands of the neck ; caries of the bones, especially of the face, with a discharge smelling like decayed cheese.

Iodum.—Syphilitic cachexia ; pustular eruptions on the skin and secondary lesions of the mucous membrane.

Kali bich.—Ulcers of the fauces and mouth that tend to perforate, surrounded by a copper-colored zone ; deep ulceration of the tongue ; scaly patches on the tongue ; discharge of hard, green mucus from the throat, coughed up with difficulty from the posterior nares in the morning ; ozæna and caries of the bones of the nose ; ulcers spread superficially and not deeply ; syphilitic laryngitis with dry, hoarse, barking cough ; nodes on the cranium with deep pain in the osseous tissue ; pustular and other tertiary eruptions with deep ulceration.

Kali iod. is indicated in all the tertiary lesions of the skin, gummatous infiltration of the internal organs, and frequently in some of the secondary conditions found in hereditary syphilis. In scrofulous and debilitated constitutions ; violent headache, with hard lumps on the head ; alopecia ; roseola, papular and pustular eruptions on the face, scalp, chest and body, that on healing leave a cicatrix ; tertiary syphilides ; rupia ; discolored ulcers ; gummatous infiltration of the nervous tissue and the internal organs with their local and reflex symptoms ; foul breath, sore throat ; ulceration of the bones of the nose ; ozæna with greenish-yellow and exhausting discharge ; ulcers eating deeply into the tissues and leaving large scars ; gummatous infiltration of the bones and periosteum, these infiltrations have no fluctuations, but have a deep doughy feeling, with throbbing, gnawing, burning, boring pains, which are worse at night ; enlarged glands in the groin, neck, etc. ; infiltrations of the soft tissues and bones ; ulceration of bones. Within the past year this drug in the 1x, 2x and 3x triturations has been employed in some

of the most pronounced forms of tertiary syphilis at the Metropolitan Hospital with results which were both brilliant and satisfactory, the effect of the drug often being more efficient and marked than when it had been given in large doses.

Lachesis. — Gangrenous and phagedenic chancres ; sore throat ; ulceration of the mouth and throat ; ulcers surrounded by a bluish areola with constant inclination to cough, with itching and painful deglutition and regurgitation through the nose ; violent pain in the head ; pains in bones worse at night ; flat ulcers on the lower extremities with bluish areola ; pimples, pustules and ulcers with offensive discharge, skin around them mottled, blue-red ; swelling along the course of the veins ; discharge from the ulcers ceasing and the parts become cold and œdematous, patient cold and stupid with failing strength, dark blisters appear around the ulcers ; caries of the tibia.

Lycopodium. — Depression of the nervous system ; tearing, burning pains worse at night ; dark grayish-yellow ulcers on the throat, especially the right side, with cough and hoarseness from similar ulcers on the larynx ; face sallow ; copper-colored eruptions on the forehead ; ulcers of the leg sluggish and refuse to heal.

Mercurius. — The action of this drug is far-reaching. There are no lesions of the secondary stage that do not call for the administration of mercury in some form, and many in the tertiary stage are greatly benefitted by it. It diminishes the relative number of red corpuscles in the blood of the healthy person and is indicated and especially efficacious in the chloro-anæmia of syphilis, as well as in syphilitic fever, whether of the intermittent or catarrhal form ; alopecia ; pains in the bones are worse at night ; round copper-colored and red spots on the skin ; vesicles ; erythema ; papules and scaly eruptions ; small ulcerations become covered with a

crust, secrete a fetid pus; periosteum swollen, indurated and the skin over it unhealthy, with pain in the bone, restlessness, etc.

Mercurius solubilis is indicated in congenital syphilis; erythematous, papular and squamous syphilides on the palms, the spots being red and scale off; erythematous congestion of the pharynx and mucous membrane; syphilitic fever; all pains worse at night.

Mercurius dulcis is useful not only for the erythematous and papular syphilides, but particularly if the mucous membranes are involved. The Binioidide is indicated for the Hunterian chancre and late constitutional lesions of the mucous membranes of the pharynx.

The Protoiodide is useful for secondary syphilides, particularly when pustular complications are present, sore throat, alopecia, headache, etc. *Mercurius corrosivus* is indicated for papular syphilides and pronounced constitutional involvement, for destructive serpiginous ulcerations with ragged edges, eating rapidly; iritis; secondary syphilides; sore mouth and throat, especially when the uvula is swollen, red and elongated, with burning and violent constriction of the throat on any attempt to swallow liquids or solids, which causes a spasm and regurgitation of food; pulse quick and irregular; syphilis of internal organs. Acid nitrate of mercury will be of great benefit for the sticking pains in the throat, etc., with other mercurial symptoms.

Mezereum.—Local nocturnal pains; nodes on the tibia, chronic sore throat with dark redness of fauces, worse every winter, with burning and dryness down the larynx, hoarseness and hawking of phlegm.

Phosphorus.—Specific psoriasis on palmar and plantar surface of hands and feet; roseola and squamous lesions of the skin; exostosis of the long bones, pains worse at night.

Phytolacca.—Weakness and depression; nodes on the face;

whole body, including feet and face, etc., covered with pale red spots about the size of a dime. Secondary syphilides; rupia; pains in the long bones, worse at night, glands swollen; sore throat, ulcers in the throat; mucous patches.

Stillingia.—Specific affections of the long bones, with gummatous deposits; osteitis and periostitis, pains worse at night; syphilitic ulcerations of the skin covered with crusts; enlarged cervical glands; specific ozæna; ulceration of the mouth and throat; discharge from the nostrils, excoriating the nose and upper lip; tubercular eruptions of the skin.

Staphisagria.—Syphilides; round, oval, whitish, raised spots on the mucous membrane of the mouth; syphilitic gummatous ulcerations, caries of the bones with thin discharge.

Sulphur.—Copper-colored spots on the forehead; tertiary syphilides.

Local Treatment.—The primary lesion or chancre should never be cauterized except in cases of mixed infection, when, if there exists an indurated, sluggish, ulcerated sore which refuses to heal, it may be cauterized with Carbolic acid, followed by Nitric acid, or better by the actual cautery. If it is situated on the finger, the lip, the labia or the prepuce, it may be advisable to avoid the presence of an infecting ulcer, to remove it surgically and to close the wound with proper sutures, though its removal will not in any way affect the general course of the disease. A chancre must not, however, be excised until it has become stationary, that is, until there is no further extension of the induration. If excised too early, the wound will reindurate and a sore larger than the original will follow. Chancres must receive daily or more frequently, a careful antiseptic cleansing with one of the following solutions: Hydrogen peroxide diluted with three times its volume of water; Bichloride of mercury, 1-3-4000; Electrozone, 30 per cent., or Borolyptol, 1-10, and

dusted, after drying, with Dermogen, Bismuth subnitrate, Zinc oxide, Iodoform, Orthoform, Aristol, Calomel or Turpette mineral, or douched with a warm normal salt solution and dusted with Calomel, the Calomel decomposing, giving a continued nascent application of the Bichloride of mercury. The chancre must generally be kept dry, ointments of all kinds with the exception of freshly prepared Mercurial or Iodoform ointment must never be applied. Iodoform ointment is composed of the following materials :

R Mentholi,	gr. v.
Iodoformi,	℥iv.
Cetacei albi.,	℥ij
Cerati, q. s. ad,	℥j.

M. Sig. Apply on lint.

This ointment is useful in sluggish, painful chancres ; when considerable pain is present a little Cocaine or Belladonna can be added. The yellow or black wash is sometimes useful, when, on account of inflammatory conditions, it is deemed advisable to use a wet dressing.

If the prepuce is long and the preputial orifice narrowed or contracted by a syphilitic inflammatory induration, lateral incision of the foreskin may be advisable to permit of the proper local care of the original sore and prevent gangrenous involvement, etc. In the female, frequent douching with an aqueous solution of Bichloride of mercury, 1-3000, and the application of Gray plaster, held in place by a proper binder, will be of local benefit, though often the original lesion will not disappear until the treatment of the secondary conditions is well under way.

Friction of the parts and uncleanness are often responsible for serious complication, movements of the body, therefore, must be restricted or properly guarded. Coitus must be absolutely interdicted while a lesion is present, and further, in the author's opinion, until the disease is cured. No protection

to the second party is sufficient to justify the risk of contamination.

Erythematous syphilides rarely require local care as they usually disappear rapidly under proper medication, but, if pigmentation remains, its removal will be facilitated by the daily application after a hot bath of Squibbs' 20 per cent. Oleate of mercury. Papular tubercles and squamous lesions on the face or elsewhere are sometimes particularly objectionable, their removal can be quickened and pigmentation prevented or removed by the application of a 2 to 10 per cent. Ungentum hydrarg. ammoniatum at night, or

℞ Hydrarg. bichloridi,	gr. v.-x.
Tinct. benzoini comp.,	℥j.

This preparation discolors the skin somewhat and is not readily removed.

℞ Hydrarg. bichloridi,	gr. v.-x.
Collodii,	℥j.

Sig. Apply daily with a brush.

is very efficacious, but sometimes it blisters the skin and must, therefore, be used with discretion. The use of the Bichloride of mercury or Tar soaps is often beneficial and effective. Oleate of copper acts kindly in the removal of pigmentary lesions. It should be rubbed in well and allowed to remain over night.

Crusts and squamous lesions respond well to applications of Ungentum hydrarg. nitr. Ecthymatous and superficial ulcerations, after proper antiseptic removal of crusts and cleansing, heal kindly under the mercurial salves. Ulcers should be cleansed daily with a 30 per cent. solution of Peroxide of hydrogen, then douched with a 50 per cent. aqueous solution of Electrozone, and Mercurial, Iodoform, Citrin or White precipitate ointment applied. Should the ulcerations become phagedenic they must be frequently douched with a 1-500 aqueous solution of Bromine, the parts being kept moist with stoupes of the same solution.

Pustular and pustulo-crustaceous syphilides respond kindly to the mercurial vapor baths and the local application of Zinc ointment. Specific ulceration of the leg must be cleansed daily with a 30 per cent. solution of Peroxide of hydrogen, covered with mercurial ointment, and the entire leg and foot encased in a roller stockinette bandage. Chronic serpiginous ulceration may require the prolonged antiseptic bath, or curettement and treatment on general principles.

Nodes and diffuse osteo-periostitis are benefitted and absorption hastened by the daily friction of the parts and the application of Ungentum hydrarg., Oleate of mercury or Iodum comp. Sometimes it is best, when the lesion is obstinate, to first blister the overlying skin before applying the selected ointment. The 10 per cent. Oleate of mercury is particularly serviceable in relieving pain in the head resulting from lesions in the cranial bones. The galvanic current is also useful. Necrosis and bony growths which are a menace to health and comfort must be treated surgically.

Lesions of the mucous membrane in secondary syphilis require prophylactic, local and remedial measures. Cleanliness is of the first importance. The severity of the lesions will largely depend on the care and attention given to them; the teeth should be brushed night and morning, using a soft brush; any tartar on the teeth must be removed, and the mouth and throat gargled once or more daily with Listerine, Tincture of myrrh, Chlorate of potash, Bicarbonate of soda, Sodium chloride or Borax, properly diluted with warm water. Tobacco in all forms must be discarded.

The following gargle is very serviceable :

R Sodii boratis,	℥ iij.
Tr. catechu,	℥ iv.
Tr. myrrhæ,	℥ iv.
Aqua,	℥ vij.

M.

Or,

℞ Potass. chloratis,	3 iij.
Pulv. alumenis,	gr. xvj.
Aq. menth. pip.,	3 j.
Aquæ, q. s. ad.,	3 xvj.

M.

They may be used at any time. A gargle of Bichloride of mercury, 1-5,000 or 10,000, is sometimes useful. Mucous patches and ulcers can be treated by applications of Nitrate of silver, ten to twenty grains to the ounce, or the daily application of Glycero-iodide (ten grains of Iodine to one ounce of Glycerine), a saturated solution of Beechwood creosote and Iodine crystals, or a 40 per cent. aqueous solution of Argyrol. Before the application of the Nitrate of silver or Iodine mixture the parts must be sprayed with a cleansing solution. In severe cases cauterization is not well tolerated because it induces irritation and inflammation of the parts. This condition responds kindly to application of the Compound tincture benzoin, either alone or in combination with Bichloride of mercury, 1-10,000. When a mucous patch becomes sluggish, indolent and refuses to heal, it may be necessary to touch the patch once a week with pure Acid nitrate of mercury on absorbent cotton. When ulcerations are severe, packing the mouth, after proper antiseptic cleansing, with Iodoform gauze twice daily, and compelling respiration through the nose may be required.

The larynx should be kept clean by spraying it three or four times daily with a solution of Borax, Bicarbonate of soda (four or five grains to the ounce of warm water) or Dobell's solution; this affords much comfort to the patient. The ulceration should receive daily applications of a solution of Iodine, five to fifteen grains to the ounce of Glycerine; a 40 per cent. solution of Argyrol, or a solution of Nitrate of silver, five to thirty grains to an ounce of water. Rapidly supervening

œdema may require tracheotomy. Moderate exercise, fresh air, good nourishment, massage, etc., are always advisable. *Mercurius solubilis* or *Mercurius corrosivus* are indicated for the erythema and early ulcerations ; *Kali iodide* for deep ulceration, gummata and œdema ; *Aurum* when the bones and cartilage are affected, associated with mental depression ; Nitric acid for sharp sticking pains in the larynx, offensive expectoration and hoarseness ; *Mezereum*, *Hepar sulphur* and *Kali bichromicum* are frequently called for in special conditions and Sulphur in neglected cases with fibrinous indurations.

Syphilis of the rectum, when recognized, can be cured by pushing specific medication ; later, injections of thin flaxseed tea give much relief. If ulcers are present they may require cleansing with a dilute aqueous solution of Mercury bichloride, Pyrozone or Hydrogen peroxide and dusting with Calomel, Iodoform or Aristol, or one of the last three can be used in the form of suppositories. When the stricture is excessive operation will be necessary.

Syphilitic lesions of the anus can often be avoided by daily washing of the parts after stool and the application of Calomel or some other dusting powder. When mucous patches occur, the parts must be bathed twice daily with a 30 per cent. aqueous solution of Electrozone and dried before dusting with the powder. Fissures and growths about the anus should be touched with the Paquelin cautery and dressed with Iodoform or White precipitate ointment. Papules and other syphilides, as papular syphilides, mucous patches and condylomata of the genitals must be bathed with a 50 per cent. solution of Electrozone and dusted with Calomel, or painted with Collodion containing Hydrarg. bichloride, four to twenty grains to the ounce.

Onychia and paronychia. This condition of the fingers or toes requires frequent bathing and the greatest cleanliness.

The diseased member should be frequently immersed in a warm aqueous solution of the Bichloride of mercury, 1 to 3000, and continually enveloped in caps of Gray plaster or a 5 or 10 per cent. ointment of Oleate of mercury, held in place by proper finger stalls. Palmar and plantar papules and fissures are treated in a similar way, or White precipitate ointment and gloves at bedtime may be substituted.

The scalp is also the seat of special local conditions. When papules only are present, the daily application of a little White precipitate ointment may be all-sufficient. In alopecia, the hair should be brushed for five minutes daily and the hair cut frequently and thoroughly washed once or twice a week, either with Tar soap or a solution composed of Borax, one drachm to two ounces of water. A stimulating tonic is often beneficial. If the hair is dry the following, applied as seems indicated, acts satisfactorily :

℞ Ammoniated mercury, gr. x.
Cold cream, ℥ j.

M.

Or,

℞ Flor. sulphuris, ℥ j.
Vaselin, ℥ j.

M.

Sig. Rub a little into the roots of the hair at bedtime.

If the hair is not especially brittle, one of the following can be used :

℞ Tinct. capsici annui, ℥ ij.
Glycerini, ℥ ij.
Aq. coloniensis, ℥ j.

M.

Sig. A small portion to be rubbed into the bald spots at bedtime to stimulate the parts.

℞ Acid. lactici, gr. viij.
Acid. borici, ℥ ijss.
Spts. vini gallici, ℥ j.
Aquæ destillatæ, ℥ x.

M.

Sig. A teaspoonful to be rubbed into the roots of the hair at bedtime.

If the moist eruptions on the scalp occur they should be dusted with Calomel, or treated with Ungentum hydrargyrum ammoniatum and an occasional application of a Carbolic acid solution.

Treatment of Hereditary Syphilis.—The medicinal treatment of hereditary syphilis will vary according to the age of the child. When extremely young and nursed by the mother or a wet nurse who has gained immunity from syphilis by infection, the child can be medicated through the medium of the breast milk. Potassium iodide in five to ten grain doses, when indicated, can be given to the mother or nurse four or five times daily, a greater portion of the drug being eliminated by the mammary gland and transmitted with the milk to the child. It must not, however, be pushed to such an extent as to cause gastro-intestinal irritation in either mother or infant. The various preparations of mercury are often given directly to the infant with the greatest benefit. Mercurius solubilis Hahnemannii is very frequently suitable, but if the stomach is especially deranged it is better to administer the mercury by the inunction method. This is accomplished by spreading a piece of Blue ointment about the size of a large filbert once daily upon the flannel binder, from which it is readily absorbed by the delicate skin of the child. To prevent irritation of the skin, the parts must be cleansed night and morning with soap and hot water and the position of the binder changed daily. For alternate locations the soles of the feet, axillæ and flexures of the joints can be utilized. Syphilinum in the zooth has been of unquestionable benefit and hereditary syphilis has been cured with potencies of Arsenicum, Carbo animalis, Mezereum, Calcareæ carbonica, Calcareæ phosphorica, Calcareæ iodide, Kali iodide, Kali bichromicum, Hepar sulphur, Graphites, Sulphur, Thuya, etc., without recourse to mercury. In late hereditary syphilis excellent results are often obtained by

the administration of increasing doses of Mercauro. The treatment by mercury must always be intermittent. Potassium iodide in the 1x, 2x and 3x triturations, as well as in full doses, is often curative, the remedy covering the totality of the clinical history must always be administered.

The child must be nursed by the mother if her health is good, as Collie's law excludes all danger to her. If not, the Walker-Gordon laboratory prepared milk, made to agree with the child, can be recommended, or the following can be given :

• Cream,	3 jss.
Milk,	3 j.
Water,	3 v.

To this add two teaspoonfuls of Sugar of milk. Bottle in proper feedings, heat to 167° F., cork tightly with absorbent cotton and place in refrigerator until wanted for use, then warm and add a half teaspoonful of lime water to each feeding. Malted milk, Carnrick's, Nestle's or Mellin's food, or condensed milk (not canned), diluted one to ten or seven, as required by the age of the child, can be used to advantage.

Absolute cleanliness is of paramount importance. Irritating applications should be avoided as the delicate skin of the hereditary syphilitic is extremely liable to abrasion from any slight cause. Excoriations and ulcerations should be kept dry, clean and dusted with Calomel, Stearate of zinc or some other mild astringent. Condylomatous conditions should, after proper cleansing, be dusted with Calomel.

Lesions of the mucous membrane of the nose and throat should be relieved by nasal sprays as required. The relatives and friends of the syphilitic infant must always be warned of the danger of contagion which is ever present. The general care and treatment is governed by the rules given under the treatment of syphilis.

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